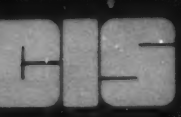
NOTE

This Microfiche meets the quality requirements of the American National Standard for Microfiche of Documents (ANSI PH5.9-1975). However, because of imperfections in the document from which it was made, it contains images that are illegible or difficult to read. The source document for this microfiche is the best copy that could be obtained prior to filming.

Congressional Information Service, Inc.
Washington, D.C.



S. HRG. 98-98

YELLOW RAIN: THE ARMS CONTROL IMPLICATIONS

HEARING

BEFORE THE

SUBCOMMITTEE ON ARMS CONTROL, OCEANS, INTERNATIONAL OPERATIONS AND ENVIRONMENT

OF THE

COMMITTEE ON FOREIGN RELATIONS UNITED STATES SENATE

NINETY-EIGHTH CONGRESS

FIRST SESSION

ON

"YELLOW RAIN" (CHEMICAL AND TOXIN WEAPONS USE): THE ARMS CONTROL IMPLICATIONS

FEBRUARY 24, 1983

Printed for the use of the Committee on Foreign Relations

U.S. GOVERNMENT PRINTING OFFICE
18-467 O WASHINGTON: 1983

S381-29

COMMITTEE ON FOREIGN RELATIONS

CHARLES H. PERCY, Illinois, *Chairman*

HOWARD H. BAKER, JR., Tennessee	CLAIBORNE PELL, Rhode Island
JESSE HELMS, North Carolina	JOSEPH R. BIDEN, JR., Delaware
RICHARD G. LUGAR, Indiana	JOHN GLENN, Ohio
CHARLES McC. MATHIAS, JR., Maryland	PAUL S. SARBANES, Maryland
NANCY L. KASSEBAUM, Kansas	EDWARD ZORINSKY, Nebraska
RUDY BOSCHWITZ, Minnesota	PAUL E. TSONGAS, Massachusetts
LARRY PRESSLER, South Dakota	ALAN CRANSTON, California
FRANK H. MURKOWSKI, Alaska	CHRISTOPHER J. DODD, Connecticut

EDWARD G. SANDERS, *Staff Director*
GERYLD B. CHRISTIANSON, *Minority Staff Director*

SUBCOMMITTEE ON ARMS CONTROL, OCEANS, INTERNATIONAL OPERATIONS AND ENVIRONMENT

LARRY PRESSLER, South Dakota, *Chairman*

JESSE HELMS, North Carolina	ALAN CRANSTON, California
NANCY L. KASSEBAUM, Kansas	EDWARD ZORINSKY, Nebraska

CONTENTS

	Page
Hearing day:	
February 24, 1983	1
Statement of—	
Davies, Rear Adm. Thomas D., USN (Ret.), Potomac Falls, Md	84
Eagleburger, Hon. Lawrence S., Under Secretary of State for Political Affairs	1
Leonard, Hon. James F., chairman of the board of the Committee for National Security, former U.S. Representative to the Committee on Disarmament, Washington, D.C	86
Seagrave, Sterling, Stevensville, Md	79
Townsend, Dr. Amos R., International Rescue Committee, Bangkok, Thailand	66
Insertions for the record:	
Chemical warfare in Southeast Asia and Afghanistan, report to the Congress from Secretary of State Alexander M. Haig, Jr., March 22, 1982	5
Chemical warfare in Southeast Asia and Afghanistan: An update, report from Secretary of State George P. Shultz, November 1982	37
U.S. detailed views on the contents of a chemical weapons ban, submitted to the Committee on Disarmament (Geneva), February 10, 1983	50
A cloudburst of yellow rain reports—reprinted from Science, December 17, 1982	61
Is the United States crying wolf on yellow rain, or is everyone else ignoring evidence?—reprinted from the Wall Street Journal, December 14, 1982	63
Biographical data of Amos Townsend	65
Prepared statement of Dr. Amos R. Townsend	67
Prepared statement of Sterling Seagrave	81
Prepared statement of Rear Adm. Thomas D. Davies, USN (Ret.)	85
Prepared statement of Hon. James F. Leonard	87
ACDA's responses to additional questions submitted for the record	101
Admiral Davies' responses to additional questions submitted for the record	103
Dr. Townsend's responses to additional questions submitted for the record	103
Appendix:	
Prepared statement of Stuart J. D. Schwartzstein, director, chemical/biological weapons information project, Institute for Foreign Policy Analysis, Inc	109

YELLOW RAIN: THE ARMS CONTROL IMPLICATIONS

THURSDAY, FEBRUARY 24, 1983

UNITED STATES SENATE,
SUBCOMMITTEE ON ARMS CONTROL, OCEANS,
INTERNATIONAL OPERATIONS AND ENVIRONMENT OF THE
COMMITTEE ON FOREIGN RELATIONS,
Washington, D.C.

The subcommittee met, pursuant to notice, at 2:45 p.m., in room SD–419, Dirksen Senate Office Building, Hon. Larry Pressler (chairman of the subcommittee) presiding.

Present: Senators Pressler and Percy.

Senator PRESSLER. The committee will come to order and we will begin our hearing. We will have to interrupt at about 2:57. There is something on the floor that I absolutely must do.

I will not make my opening statement at this time, but Secretary Eagleburger is here. He arrived here this morning, many hours ago. This hearing was to have started at 11 a.m., but was delayed due to a hearing on the Adelman confirmation. Some suggested that I reschedule this session, but given the importance of this issue I thought it appropriate to conduct this hearing today, so I am going to put off my opening statement and hear from Secretary Eagleburger. If you can summarize, then I will have to go and come back in about 15 minutes—whichever way pleases you.

Secretary EAGLEBURGER. Mr. Chairman, I will read fast. I think I could make it in about 10 minutes.

Senator PRESSLER. Thank you.

STATEMENT OF HON. LAWRENCE S. EAGLEBURGER, UNDER SECRETARY OF STATE FOR POLITICAL AFFAIRS

Secretary EAGLEBURGER. I appreciate the opportunity to appear here today to discuss the arms control implications of the use of chemical and toxin weapons.

Our goal is to see their complete elimination. Our seriousness and dedication was shown most recently during Vice President Bush's trip to Europe. While in Geneva, he addressed the Committee on Disarmament [CD] and spoke forcefully and persuasively of the need to rid the world of chemical and toxin weapons. He took the additional constructive step of announcing an important U.S. initiative to achieve that goal.

More than a dozen years ago we unilaterally renounced the possession of all biological and toxin weapons. Subsequently, we played a major role in negotiating an international agreement banning these weapons. A large number of countries, including the Soviet Union, joined us in ratifying the treaty.

We expected that the threat of this whole class of weapons would disappear. Yet, that turned out to be a false hope. Toxin weapons are being used right now in Afghanistan and Southeast Asia. Repeated calls to cease the violation of international agreements go unheeded. The Soviet Union, Vietnam, and Laos continue to deny their acts, which we and others have documented.

We cannot, and will not, remain silent about the death and suffering caused by chemical and toxin weapons since the mid–1970's. Yet we know it is not sufficient merely to exhort the world to condemn those who supply and use them. Rather, we must constructively find a way to insure that these weapons are effectively abolished.

Toxins and chemical warfare agents have been developed in the Soviet Union and provided to Laos and Vietnam. The Soviets use these agents themselves in Afghanistan and have participated in their preparation and use in Southeast Asia. Neither the Vietnamese, Laotians, nor Afghans could have developed or produced these weapons. The Soviet Union can, however, and has extensively trained and equipped its forces for this type of warfare.

An incident which occurred in 1979 in Sverdlovsk in the Soviet Union raised questions as well about Soviet compliance with the prohibition on production of biological weapons. A sudden major pulmonary anthrax outbreak occurred near a suspected biological weapons facility. The Soviets' explanation—if one can call it that—continues to be inconsistent with available evidence.

Nearly 8 years ago, the world first heard of the use of lethal chemical weapons in Laos. In 1978, similar reports began coming out of Kampuchea, and in 1979 from Afghanistan. We have now accumulated a large body of evidence on the use of these weapons and the plight of their victims. The judgments are well documented and the facts do not support any other conclusion.

The United States has raised this issue publicly in the United Nations, with Congress, and elsewhere. We have issued a series of reports providing extensive evidence of these attacks and the agents used. The most recent report was submitted to the Congress and the United Nations by Secretary Shultz on November 29 of last year.

Canada, Thailand, and the United Nations have produced documentation. Other nations have also voiced their concern through their votes in the United Nations and individual and collective statements. Private individuals and organizations are also being heard. Some of these individuals are here today.

Mr. Chairman, it is not as if we were dealing in an area in which civilized standards are vague or international law inadequate. To the contrary, there are two principal international agreements which place restrictions on chemical, biological, and toxin warfare. The first is the 1925 Geneva protocol, one of the oldest treaties on weapons still in force, which prohibits the first use of these types of weapons.

The second treaty is the 1972 Biological and Toxin Weapons Convention, which bans the development, production, stockpiling, transfer, and possession of biological and toxin weapons. Both the United States and the Soviet Union are parties to this treaty, as are Afghanistan, Laos, and Vietnam. Not only are both these treaties being violated in Southeast Asia and Afghanistan, but so are universally accepted standards of international law.

Mr. Chairman, the continuing use of chemical and toxin weapons in Southeast Asia and Afghanistan has obvious implications for

United States-Soviet relations. It does not mean that we can no longer work with the Soviet Union to build a more stable and secure world, for as the two superpowers we have a special responsibility. It does mean, however, that the policies of our Nation cannot be based on a benign or naive view of the Soviet Union and its intentions. The President has noted the responsibilities we carry and the need for strength and preparedness. With a realistic appraisal of the Soviet goals, and an appreciation that they are not constrained by many of the values we support, we can proceed, with caution and prudence, to help build a world eventually free from chemical, biological, and toxin weapons.

We have all heard the charges that the continuing Soviet defiance of international norms through the use of chemical and toxin weapons proves that arms control cannot work. Further, we are asked: If the Soviets would so blatantly violate two important international treaties, what will keep them from violating other arms control agreements as well?

Mr. Chairman, I believe that Soviet actions lead to a different conclusion—real, equitable, and fully verifiable arms control is an absolutely necessity. It is not that arms control is pointless; it is that we have to do a better job of it.

Effective arms control is necessary if we are to reduce the number of destructive weapons in the world and reduce the risk of war. As the President has said, arms control is not an end in itself, but a vital means toward insuring peace and international stability.

Yet if arms control is to work, agreements of this kind must be fully and effectively verified. The Soviet Union will not feel compelled to live by its international agreements if it knows that digression from these agreements will go undetected and unchallenged, and it is not obliged to pay a political cost. To sign agreements which lack tough verification standards would be not only misleading, but also a disservice to all who want real arms control. To refuse to sign equitable agreements with strong verification procedures which are in our own interests would be equally misguided.

The Geneva protocol and the 1972 Biological and Toxin Weapons Convention do not contain verification provisions or adequate measures to address questions of compliance. We are seeking, with others, to remedy these shortcomings and to establish Soviet compliance with both agreements.

In December, the U.N. General Assembly recommended by an overwhelming vote to call on the states that are parties to the Biological and Toxin Weapons Convention to hold a special conference as soon as possible to establish effective procedures for compliance with its provisions. In December, the U.N. General Assembly also requested the Secretary-General to establish procedures to investigate promptly possible violations of the 1925 Geneva protocol. We believe that it is important that both resolutions be implemented promptly and we will continue to participate in follow-on actions.

The United States strongly supported the adoption of both resolutions. The Soviet Union and a number of her allies did not. Soviet cooperation is necessary if we are to achieve the goals embodied in the resolutions which are directed at making these two treaties effective. Opportunities are available to the Soviet Union for such cooperation.

We have taken steps to achieve a comprehensive ban on chemical weapons. On February 10 we tabled, in the 40-nation Committee on Disarmament in Geneva, our detailed views on the content of a com-

plete and verifiable chemical weapons convention. In presenting this initiative we reiterated our commitment to the objective of a chemical weapons ban and stressed its urgency.

We propose that any activity to create or maintain a chemical weapons capability should be forbidden. Existing chemical weapons stocks and production and filling facilities should be promptly declared and destroyed over a specified time period.

Our proposal emphasizes the importance of mandatory onsite inspection. An independent, impartial verification system observed by, and responsive to, all parties is essential if we are to be confident that the provisions of the convention are faithfully observed. National technical means alone are insufficient, as they are available only to a few and have only a limited verification usefulness. Systems of "national verification," or self-inspection, are not the answer.

We have proposed that the following be subject to mandatory onsite inspection: declared chemical weapons stocks and the process of their elimination; declared chemical weapons production and filling facilities, and the process of their elimination; declared facilities for permitted production of chemicals which pose particular risks. We have also proposed that the parties be obliged to permit inspections on a challenge basis when questions of compliance arise.

The verification approach we have proposed is tough, but fair and practical. Although no one can guarantee absolute verification, we believe that our security and that of all other countries would be safeguarded. We are insisting on a level of verification which meets that objective and we are prepared to explore seriously any alternative suggestions by other nations to achieve effective verification.

Our views are not fixed but subject to further refinement. The possibility of resuming bilateral negotiations with the Soviet Union remains open. Such negotiations occurred earlier, but lapsed in deadlock in mid-1980, principally over the issue of verification.

We have repeatedly stated that for bilateral negotiations to be fruitful, the Soviet Union would need to demonstrate, rather than simply profess, that it is ready to accept effective provisions to verify compliance with a chemical weapons prohibition. We must also be assured that the Soviet Union is willing to abide by existing agreements.

The focus of negotiations should be on the difficult issues which are impeding progress, especially verification and compliance. Such issues must be resolved if genuine achievements are to take place. Concentrating on the less contentious issues, or even drafting treaty texts, would be a fruitless exercise if an effective verification framework cannot be built.

Mr. Chairman, we hope that our arms control initiatives regarding these weapons will succeed. We do not, however, have any illusions. Agreement will require a major revision of Soviet military strategy, which accepts use of these weapons. We must also overcome longstanding Soviet aversion to effective onsite monitoring. Therefore, conclusion of an acceptable agreement cannot be guaranteed.

This administration remains dedicated to the goal of completely eliminating all chemical, biological, and toxin weapons. Success in this enterprise would enhance not only our security, but that of the whole world.

Thank you, Mr. Chairman.

[The reports referred to follow:]

Special
Report No. 98

United States Department of State

Chemical Warfare in Southeast Asia and Afghanistan

Report to the Congress
from Secretary of State
Alexander M. Haig, Jr.,
March 22, 1982

THE SECRETARY OF STATE
WASHINGTON

TO THE CONGRESS OF THE UNITED STATES:

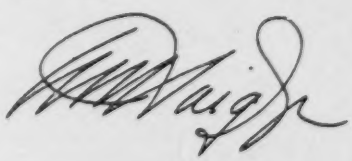
The years from 1914 to 1918 were among the most destructive of human life in mankind's history. Yet the sacrifice of millions brought no lasting peace. Of the elaborate structure for collective security, and the series of pacts outlawing war and controlling armaments which were negotiated in the aftermath of this First World War, little remains today. The League of Nations, the Kellogg-Briand Pact, and the Washington Naval Agreement were all swept away in the tide of aggression which culminated in a second global conflict. Almost the sole surviving monument, in the law of nations, to the twenty million dead of the First World War is the 1925 Geneva Protocol outlawing chemical and biological warfare.

Today this accord, among the oldest of arms control agreements still in force, along with another more recent such agreement banning biological and toxin weapons, is again in danger of being swept away by a new tide of aggression. Over the past seven years chemical and toxin weapons have been used, on an ever-widening scale, in genocidal campaigns against defenseless peoples. These weapons are being used for precisely the reason mankind has condemned and sought to outlaw them—because of their indiscriminate action and horrific effects. Today evidence of chemical and toxin warfare has accumulated to the point where the international community can no longer ignore the challenge.

The enclosed report on the use of chemical and toxin weapons by the Soviet Union and its Allies in Laos, Kampuchea, and Afghanistan has been prepared for submission to the Congress, to the United Nations, and to each member of the international community. The report is drawn from information made available to the United States Government since 1975. It contains the most comprehensive compilation of material on this subject available, and presents conclusions which are fully shared by all relevant agencies of the United States Government.

The international community and the world public need not rely solely on this report to form their judgment, nor only upon the United States to provide their information. Lethal chemical and toxin weapons are regrettably still in use in Laos, Kampuchea, and Afghanistan. New victims appear, new witnesses come forward, new scientific evidence is uncovered with increasing frequency. The great bulk of the information in the enclosed report could have been collected and analyzed by any interested government, international organization, or major news service. If the efforts of the United States Government to call attention to chemical warfare in Afghanistan and Southeast Asia stimulate others to discover for themselves, and join in efforts to expose the truth, this report will have served its most important purpose.

Sincerely,



Alexander M. Haig, Jr.

Chemical Warfare in Southeast Asia and Afghanistan

CONTENTS

	Page
Introduction	4
Key Judgments	6
Methodology	6
Discussion of Findings	7
What Chemical Agents Are Being Used?	7
Laos	8
Kampuchea	10
The Soviet Connection in Southeast Asia	13
Afghanistan	14
Motivation for Using Chemical Weapons	17

ANNEXES

Annex A: A Lao Pilot's Account	18
Annex B: Findings of U.S. Government Investigative Teams: Use of Chemical Agents Against the H'Mong in Laos	19
Annex C: Medical Evidence	21
Annex D: Analysis and Review of Trichothecene Toxins	23
Annex E: Overview of Natural Occurrence and Significant Properties of Trichothecenes	27

MAPS

Laos: Chemical Warfare Operational Areas	9
Kampuchea: Chemical Warfare Operational Areas	12
Afghanistan: Chemical Warfare Operational Areas	15

	Page
TABLES	
Table 1: Laos: Summary of Reported Chemical Attacks and Associated Deaths, 1975–81	8
Table 2: Kampuchea: Summary of Reported Chemical Attacks and Associated Deaths, 1978–81	11
Table 3: Afghanistan: Summary of Reported Chemical Attacks and Associated Deaths, 1979–81	14
Table B–1: Reports of Probable Chemical Agent Attacks in Laos	20
Table C–1: Comparison of Reported "Yellow Rain" Effects With Known Trichothecene Effects	22
Table D–1: Symptoms of Chemical Attacks Reported in Laos, Kampuchea, and Afghanistan	24
Table E–1: Trichothecene-Producing Fungi	28
Table E–2: Historical Trichothecene Mycotoxicoses	28
Table E–3: Physicochemical Methods for Detection of Trichothecenes in Feedstuffs	30
Table E–4: Spontaneous Occurrence of Trichothecene Mycotoxins	31

FIGURE

Figure E–1: General Structure of Trichothecenes	29

This study presents the evidence available to the U.S. Government on chemical warfare activities in Laos, Kampuchea, and Afghanistan through January 1982 and examines the Soviet involvement in these activities. It is based on a massive amount of information, from a variety of sources, which has been carefully compiled and analyzed over the years. The paper is accompanied by annexes and tables that provide details of the medical evidence and sample analyses, a technical description of trichothecene toxins, and other supporting data.

INTRODUCTION

Nearly 7 years ago, reports of the use of lethal chemical weapons began to emerge from Laos. In 1978, similar reports started to come from Kampuchea, and in 1979 from Afghanistan. Early reports were infrequent and fragmentary, reflecting the remoteness of the scene of conflict and the isolation of those subjected to such attacks. In the summer of 1979, however, the State Department prepared a detailed compilation of interviews with refugees from Laos on this subject. That fall, a U.S. Army medical team visited Thailand to conduct further interviews. By the winter of 1979, the United States felt that it had sufficiently firm evidence of chemical warfare to raise the matter with the governments of Laos, Vietnam, and the Soviet Union. All three governments denied that a basis for concern over the use of chemical warfare agents existed.

Dissatisfied with these responses, and possessing further reports that lethal chemical agents were in use in Southeast Asia and Afghanistan, the U.S. Government in 1980 began to raise the issue publicly in the United Nations, with the Congress, and in other forums. In August of that year, the State Department provided extensive documentation containing evidence of chemical weapons attacks to the United Nations and also made this material publicly available. In December, as a result of efforts by the United States and other concerned nations, the U.N. General Assembly voted to initiate an international investigation into the use of chemical weapons. This investigation is still underway. To date, the U.N. investigating team has been denied admission to any of the three countries where these weapons are in use.

Despite the volume of information on chemical warfare in Southeast Asia which had become available by 1980, there remained one major unresolved issue—the exact nature of the chemical agents in use. Collection of physical samples was hindered by the remoteness of the then principal areas of conflict—as many as 6 weeks by foot to the nearest international border. Tests for known chemical warfare agents on those samples that were obtained proved consistently negative.

In order to identify the chemical agents in use, U.S. experts in late 1980 began to go back over all the reporting—as far back as 1975—looking for new clues. In particular, they sought to match the reported symptomatology of victims—which commonly included skin irritation, dizziness, nausea, bloody vomiting and diarrhea, and internal hemorrhaging—with possible causes. As a result of this review, the U.S. Government in mid-1981 began to test physical samples from Southeast Asia for the presence of toxins. These substances are essentially biologically produced chemical poisons. Although they have never before been used in war, this was a technical possibility, and it was noted that certain toxins could produce the sorts of symptoms observed in Southeast Asian victims of chemical warfare.

In August 1981, unnatural levels and combinations of lethal trichothecene toxins were detected in the first sample to be tested by the United States for such agents. This consisted of vegetation taken from a village in Kampuchea where an attack occurred in which people had died after exhibiting the symptoms described above. In succeeding months, further samples, taken from the sites of attacks in both Kampuchea and Laos, yielded similar results. So did samples of blood taken from victims of a chemical attack in Kampuchea.

Despite a continued flow of reports, dating back over 7 years, of chemical warfare in Southeast Asia and more recently Afghanistan, and despite the still mounting physical evidence of the use of trichothecene toxins as warfare agents, doubts as to the conclusive nature of the available evidence have persisted. These doubts have arisen for several reasons. For one, the evidence of the use of lethal chemical weapons has become available over a period of several years and from a variety of sources. Few governments, journalists, or interested members of the public have been exposed to all of this evidence, nor has it been available in any one place. A second difficulty has been the inevitable need for the U.S. Government to protect some of the relevant information, often gathered at personal risk to individuals who secured it, or obtained through the use of highly sensitive methods.

Chronology of Diplomatic/International Actions on Chemical Warfare Use

October 1979

The United States called to the attention of the Lao Charge d'Affaires in Washington the press reports alleging use of poison gas in Laos.

Assistant Secretary of State for East Asian and Pacific Affairs Holbrooke traveled to Vientiane and discussed our concerns over H'Mong human rights and other issues with Lao leaders.

Late 1979

The Department of State directed U.S. diplomatic missions in the Southeast Asia area to seek to develop information on the alleged use of poison gas against the H'Mong.

January 1979

The Department of State again informed the Lao Embassy of U.S. concerns about reports of poison gas use in Laos, coupling this with a similar demarche in Vientiane. The Lao denied the validity of the reports.

March 1979

The U.S. Representative to the 35th session of the U.N. Human Rights Commission expressed U.S. concern about the plight of the H'Mong, specifically raising the poison gas use issue.

May 1979

A State Department representative went to refugee camps in Thailand to interview H'Mong claiming to be eyewitnesses and/or victims of poison gas attacks in Laos.

A State Department representative visited Vientiane where he discussed the problem with various diplomatic missions and the senior U.N. representative in Laos. During that visit, he raised U.S. concerns about the problem directly with the Lao Foreign Ministry.

September 1979

A Department of Defense medical team was dispatched to Thailand to interview and prepare a report on H'Mong refugees having knowledge of gas attacks in Laos.

November 1979

Demarches were made to the Vietnamese in Paris and to the Soviets in Moscow expressing U.S. concerns about reports of poison gas being used against "resistance forces" in Laos. Both the Soviets and Vietnamese supported the Lao denial of the validity of the reports.

December 1979

State and Department officials presented evidence of gas attacks in Laos to the House Foreign Affairs Committee.

February 1980

A bilateral demarche was made to the Soviets about U.S. concerns regarding chemical warfare use in both Laos and Kampuchea and about reports that chemical weapons were being used by the Soviets in Afghanistan. The demarche was made in Geneva in the context of the U.S./Soviet bilateral negotiations on a comprehensive prohibition of chemical weapons production, development, and stockpiling.

May 1980

An interagency team of U.S. Government political, technical, and intelligence officers was dispatched to Europe to brief the allies about the problem and to stimulate support for having an impartial international investigation conducted.

July 1980

Another bilateral demarche was made to the Soviets in the context of the U.S./Soviet bilateral chemical warfare negotiations, concerning the problem of the reported use of chemical weapons in both Southeast Asia and Afghanistan.

The Inter-Parliamentary Union adopted a resolution calling for an impartial international investigation of reports of chemical weapons use.

August 1980

The United States circulated to U.N. member states a 125-page compendium of reports and declassified intelligence information pertaining to the use of chemical weapons in Laos, Kampuchea, and Afghanistan.

The 40-nation Committee on Disarmament included language in its Annual Report to the U.N. General Assembly on the need for an impartial international investigation of the problem of chemical weapons use.

December 1980

With the full and active support of the United States, the West, and others, the U.N. General Assembly adopted a resolution (A/35/144 C) establishing a U.N. investigation, under the auspices of the U.N. Secretary General and with the assistance of qualified medical and technical experts, of reports of chemical weapons use. The vote was 78 in favor to 17 opposed, with 36 abstentions.

March 1981

In accordance with U.N. General Assembly Resolution A/35/144 C and the request of the U.N. Secretary General, the U.S. submitted detailed information pertaining to the reports of the use of chemical weapons in Southeast Asia and Afghanistan. The U.S. submission consisted of a letter summarizing the U.S. submission, the U.S. compendium of reports from August 1980, an update to that compendium covering the period through January-February 1981, the transcripts of congressional hearings held on the subject in December 1979 and in April 1980, and the texts of House and Senate resolutions condemning the use of chemical weapons.

July 1981

The United States provided further details and written responses to questions from the U.N. Group of Experts concerning the U.S. submission of March 1981.

September 1981

Secretary Haig announced, in his September 13 speech in Berlin, that the United States had obtained physical evidence of the use of lethal mycotoxins in Southeast Asia, discovered in the analysis of a leaf and stem sample obtained from the site of a chemical attack in Kampuchea.

On September 14, the United States submitted a report on the new evidence pertaining to the use of mycotoxins to the U.N. Group of Experts investigating reports of chemical weapons use.

Under Secretary of State for Political Affairs Stoessel held a press conference in Washington on September 14 and provided a detailed press backgrounder on the new evidence.

Secretary Haig raised U.S. concerns about the new evidence pertaining to the use of lethal mycotoxins in Southeast Asia and about the 1979 Sverdlovsk anthrax incident with Soviet Foreign Minister Gromyko during their bilateral consultations at the United Nations in New York.

October 1981

Following up the Haig/Gromyko discussions, detailed bilateral demarches were made to the Soviets in Washington by Acting Arms Control and Disarmament Agency Director Grey, and a followup in Moscow by the U.S. Deputy Chief of Mission, on the general subject of Soviet Biological Warfare Convention compliance and specific U.S. concerns regarding the 1979 Sverdlovsk anthrax incident and the evidence of the use of trichothecene mycotoxins in Southeast Asia. The Soviets rejected U.S. concerns once again in their formal response in November.

An interagency team of political, technical, and intelligence officers was dispatched to Europe to brief the allies about the new evidence of the use of lethal mycotoxins in Southeast Asia.

A delegation of U.S. Government political, technical, and medical experts appeared before the U.N. Group of Experts to respond to questions pertaining to the U.S. submission on September 14 of new evidence concerning the use of lethal mycotoxins in Southeast Asia.

November 1981

The U.N. Group of Experts investigating reports of chemical weapons use traveled to Thailand to visit refugee camps and interview and examine survivors and eyewitnesses of chemical attacks in Laos and Kampuchea. While there, the experts also obtained samples from alleged chemical attacks and samples of vegetation and blood from refugees exposed to chemical attacks.

Richard Burt, Director of the Bureau of Politico-Military Affairs, in testimony before the Congress, announced the results of analyses of additional samples of chemical warfare use revealing the presence of high levels of mycotoxins and the results of analyses of control samples from Southeast Asia which were found to contain no mycotoxins.

The United States submitted a report on its analyses of chemical warfare use samples from both Kampuchea and Laos, which were found to contain high levels of mycotoxins, to the U.N. Group of Experts investigating reports of chemical weapons use.

Demarches were made to the Vietnamese in New York and to the Lao in Vientiane regarding the evidence of the use of lethal mycotoxins in the conflicts in Kampuchea and Laos. Both the Vietnamese and the Lao rejected the evidence and denied the validity of U.S. concerns.

December 1981

The U.N. Secretary General submitted the Report of the U.N. Group of Experts investigating reports of chemical weapons use (A/36/613). The report was inconclusive and stated that the group had been unable to carry out all the actions it had *intended* (i.e., on-site visits to Afghanistan, Laos, and Kampuchea) due to the refusals to cooperate of the countries concerned, and that it had been unable to complete some of the actions it had *planned* (e.g., on-site visits to Pakistan, analysis of the samples obtained in Thailand) in the time available.

With the full and active support of the United States, the West, and others, the U.N. General Assembly adopted a resolution (A/36/96 C) extending for another year the mandate of the U.N. Secretary General's Group of Experts investigating reports of chemical weapons use. The vote on the resolution was 86 in favor to 20 opposed, with 32 abstentions.

This report represents an effort of the U.S. Government to correct the first deficiency and to ameliorate the second to the extent possible. In preparation of this report, all of the information available to the U.S. Government on chemical weapons use in Laos, Kampuchea, and Afghanistan was assembled in one place. This information was again reviewed, analyzed, cross-indexed, and organized in a coherent fashion. Based upon this comprehensive analysis, a set of conclusions were drawn, conclusions which have since been reviewed and agreed on without qualification by every relevant agency of the U.S. Government.

The evidence upon which this report is based is of several kinds, including:

- Testimony of those who saw, experienced, and suffered from chemical weapons attacks;
- Testimony of doctors, refugee workers, journalists, and others who had the opportunity to question large numbers of those with firsthand experience of chemical warfare;
- Testimony of those who engaged in chemical warfare or were in a position to observe those who did;
- Scientific evidence, based upon the analysis of physical samples taken from sites where attacks had been conducted;
- Documentary evidence from open sources; and
- Intelligence derived from "national technical means."

These sources provide compelling evidence that tens of thousands of unsophisticated and defenseless peoples have for a period of years been subjected to a campaign of chemical attacks. *Taken together, this evidence has led the U.S. Government to conclude that Lao and Vietnamese forces, operating under Soviet supervision, have, since 1975, employed lethal chemical and toxin weapons in Laos; that Vietnamese forces have, since 1978, used lethal chemical and toxin agents in Kampuchea; and that Soviet forces have used a variety of lethal chemical warfare agents, including nerve gases, in Afghanistan since the Soviet invasion of that country in 1979.*

The implications of chemical warfare in Afghanistan and Southeast Asia are painful to contemplate but dangerous to ignore. This activity threatens not only the peoples of those isolated regions but the international order upon which the security of all depends. Those who today suffer chemical warfare against their homelands are powerless to stop it. The prohibitions of international law and solemn agreement are not self-enforcing. Only an alert and outspoken world community, intent to maintain those standards of international behavior it has so painfully achieved and so tenuously established, can bring sufficient pressure to bear to halt these violations of law and treaty. It is hoped that publication of this report will be one step in this process, the end result of which will be the cessation of chemical warfare and the strengthening of the rule of law in the affairs of nations.

KEY JUDGMENTS

Laos. The U.S. Government has concluded from all the evidence that selected Lao and Vietnamese forces, under direct Soviet supervision, have employed lethal trichothecene toxins and other combinations of chemical agents against H'Mong resisting government control and their villages since at least 1976. Trichothecene toxins have been positively identified, but medical symptoms indicate that irritants, incapacitants, and nerve agents also have been employed. Thousands have been killed or severely injured. Thousands also have been driven from their homeland by the use of these agents.

Kampuchea. Vietnamese forces have used lethal trichothecene toxins on Democratic Kampuchean (DK) troops and Khmer villages since at least 1978. Medical evidence indicates that irritants, incapacitants, and nerve agents also have been used.

Afghanistan. Soviet forces in Afghanistan have used a variety of lethal and nonlethal chemical agents on *mujahidin* resistance forces and Afghan villages since the Soviet invasion in December 1979. In addition, there is some evidence that Afghan Government forces may have used Soviet-supplied chemical weapons against the *mujahidin* even before the Soviet invasion. Although it has not been possible to verify through sample analysis the specific agents used by the Soviets, a number of Afghan military defectors have named the agents brought into the country by the Soviets and have described where and when they were employed. This information has been correlated with other evidence, including the reported symptoms, leading to the conclusion that nerve agents, phosgene oxime, and various incapacitants and irritants have been used. Other agents and toxic smokes also are in the country. Some reported symptoms are consistent with those produced by lethal or sublethal doses of trichothecene toxins, but this evidence is not conclusive.

The Soviet Connection. The conclusion is inescapable that the toxins and other chemical warfare agents were developed in the Soviet Union, provided to the Lao and Vietnamese either directly or through the transfer of know-how, and weaponized with Soviet assistance in Laos, Vietnam, and Kampuchea. Soviet military forces are known to store agents in bulk and move them to the field for munitions fill as needed. This practice also is followed in Southeast Asia and Afghanistan, as evidenced by many reports which specify that Soviet technicians supervise the shipment, storage, filling, and loading onto aircraft of the chemical munitions. The dissemination techniques reported and observed evidently have been drawn from years of Soviet chemical warfare testing and experimentation. *There is no evidence to support any alternative explanation, such as the hypothesis that the Vietnamese produce and employ toxin weapons completely on their own.*

METHODOLOGY

The judgments of this study were arrived at through a rigorous analytical process.

- Every relevant piece of information on reported chemical warfare incidents was reviewed, recorded, and tabulated. Numbers of attacks and deaths were screened for possible duplication. Extensive data on the Soviet chemical and biological warfare program also were reviewed.
- All the test data on physical evidence available to the U.S. Government—including environmental samples and background controls—were reviewed.
- A scientific report on toxins, which concluded that trichothecenes probably were among the agents used in Southeast Asia, was prepared.
- The medical evidence was analyzed, drawing on all available information from Southeast Asia and Afghanistan and incorporating the findings of a Department of Defense medical team, which concluded that at least three types of agents were used in Laos.
- Extensive consultations were held with government and nongovernment scientists and medical authorities, many of whom were asked to review the evidence. Experts from other countries also were consulted.

After the data were organized to permit comparative analysis, the study focused on three separate questions.

- Have lethal and other casualty-producing agents been used in Southeast Asia and Afghanistan?
- What are these agents, and how and by whom are they employed?
- Where do these agents originate, and how do they find their way to the field?

Although the evidence differs for each country, the analytical approach was the same. Testimony of eyewitnesses—date, place, and type of attack—was matched against information from defectors, journalists, international organizations, and sensitive information that often pinpointed the time and place of chemical attacks. In addition, information on military operations in the areas where chemical attacks had been reported was examined to establish whether air or artillery strikes took place or whether there was fighting in the areas where chemical agents reportedly were used. *In all three countries, instances were identified in which eyewitness accounts could be correlated directly with information from other sources on military operations in progress.*

There is no evidence of any systematic propaganda campaign by either the H'Mong in Laos or the Afghan resistance forces to promote the allegation that chemical agents have been used on their people. On the other hand, there were early indications that Pol Pot's Democratic Kampuchean resistance did engage in an organized propaganda campaign on chemical agent use. These indications made U.S. Government analysts cautious about accepting DK allegations, which increased markedly after the chemical attacks in Laos were publicized. For Kampuchea, therefore, special efforts were taken to confirm such allegations by analyzing sources of information that in no way could be considered part of a propaganda or deception campaign.

DISCUSSION OF FINDINGS

In September 1981, the U.S. Government declared publicly that toxins—poisonous chemical substances extracted from biological material—probably were the mysterious lethal agents used for many years in Laos and Kampuchea. The statement was prompted by the discovery of high levels of trichothecene toxins in a vegetation sample collected shortly after a March 1981 Vietnamese chemical attack in Kampuchea. This conclusion, however, rested on a much broader base of evidence than analysis of one sample.

By April 1980, the U.S. Government had already concluded that lethal agents almost certainly had been used against H'Mong tribespeople in Laos. There was less certainty then about the use of lethal agents in Kampuchea, mainly because of the already mentioned suspicions about the propaganda campaign of Pol Pot's Democratic Kampuchean forces, although their claims subsequently were shown to be valid. It was also concluded that chances were about even that lethal agents had been used in Afghanistan. There was little doubt by April 1980 that riot-control agents and some form of incapacitants had been used in all three countries. Since that April 1980 assessment, additional evidence has allowed a much firmer conclusion. There is now no doubt that casualties and deaths have resulted from chemical attacks in all three countries.

What Chemical Agents Are Being Used?

As soon as it was determined that chemical agents had been used, an effort was made to identify the specific agents. To do this it was necessary to collect and analyze at least one of the following: environmental samples contaminated with agents, the munitions used to deliver agents, or biological specimens from victims of an attack. A study by medical-toxicological experts of symptoms exhibited by individuals exposed to toxic agents provides a good indication of the general class of chemical agent used. Thus, the range of clinical manifestations from chemical agents, as reported by a U.S. Army investigative team in Thailand, resulted in the determination that nerve agents, irritants such as CS, and highly toxic hemorrhagic chemicals or mixture of chemicals were used in Laos.

Other medical-toxicological personnel who reviewed the evidence and conducted their own investigation reached the same conclusion. They further indicated that toxins such as the trichothecenes were a probable cause of the lethal hemorrhaging effect seen in Kampuchea and Laos. In many cases, symptoms reported by the Democratic Kampuchean forces in Kampuchea and the *mujahidin* in Afghanistan were similar to those reported by the H'Mong in Laos. Moreover, symptoms reported from Afghanistan and Kampuchea indicated that a highly potent, rapid-acting, incapacitant "knockout" chemical also was being used. *Mujahidin* victims and witnesses to chemical attacks reported other unusual symptoms, including a blackening of the skin, severe skin irritation along with multiple small blisters and severe itching, severe eye irritation, and difficulty in breathing—all of which suggests that phosgene oxime or a similar substance was used.

Collecting samples possibly contaminated with a toxic agent during or after a chemical assault is difficult under any circumstances but particularly when the assault is against ill prepared people without masks or other protective equipment. Obtaining contaminated samples that will yield positive traces of specific chemical agents depends on many factors. These include the persistency of the chemical, the ambient temperature, rainfall, wind conditions, the medium on which the chemical was deposited, and the time, care, and packaging of the sample from collection to laboratory analysis.

Many traditional or known chemical warfare agents are nonpersistent and disappear from the environment within a few minutes to several hours after being dispersed. Such agents include the nerve agents sarin and tabun; the blood agents hydrogen cyanide and cyanogen chloride; the choking agents phosgene and diphosgene; and the irritant phosgene oxime. Other standard chemical warfare agents—such as the nerve agents VX and thickened soman and the blistering agents sulfur mustard, nitrogen mustard, and lewisite—may persist for several days to weeks depending on weather conditions.

The trichothecene toxins have good persistency but may be diluted by adverse weather conditions to below detectable concentrations. To maximize the chances of detection, sample collections need to be made as rapidly as possible after a chemical assault; as with many agents, this means minutes to hours. Under the circumstances of Southeast Asia and Afghanistan, such rapid collection has simply not been possible. Although many samples were collected, few held any realistic prospect of yielding positive results. It is fortunate that trichothecenes are sufficiently persistent and in some cases were not diluted by adverse weather conditions. Thus we were able to detect them several months after the attack.

Samples have been collected from Southeast Asia since mid-1979 and from Afghanistan since May 1980. To date, about 50 individual samples—of greatly varying types and usefulness for analytical purposes—have been collected and analyzed for the presence of known

chemical warfare agents, none of which has been detected. Based on recommendations by medical and toxicological experts and findings of investigators from the U.S. Army's Chemical Systems Laboratory, several of the samples have been analyzed for the trichothecene group of mycotoxins. Four samples, two from Kampuchea and two from Laos, were found to contain high levels of trichothecene toxins. In addition, preliminary results of the analysis of blood samples drawn from victims of an attack indicate the presence of a trichothecene metabolite of T-2, namely HT-2.

A review of all reports indicates the use of many different chemical agents, means of delivery, and types of chemical attacks. The use of trichothecene toxins has been identified through symptoms and sample analysis. In some cases, however, the symptoms suggest other agents, such as nerve gas, which have not been identified through sample analysis. Significant differences as well as similarities have surfaced in the reports from the three countries. The evidence from each country, therefore, is described separately, with attention drawn to similarities where appropriate.

Laos

Reports of chemical attacks against H'Mong villages and guerrilla strongholds in Laos date from the summer of 1975 to the present (see Table 1). Most of the reports were provided by H'Mong refugees who were interviewed in Thailand and the United States. More than 200 interviews were carried out variously by U.S. Embassy officials in Thailand, a Department of Defense team of medical-toxicological experts (see Annex B), U.S. physicians, Thai officials, journalists, and representatives of international aid and relief organizations. According to the interviews, Soviet AN-2 and captured U.S. L-19 and T-28/41 aircraft usually were employed to disseminate toxic chemical agents by sprays, rockets, and bombs. In some cases, Soviet helicopters and jet aircraft were said to have been used.

The reports describe 261 separate attacks in which at least 6,504 deaths were cited as having resulted directly from exposure to chemical agents. The actual number of deaths is almost certainly much higher, since the above figure does not take account of deaths in attacks for which no specific casualty figures were reported. The greatest concentration of reported chemical agent use occurred in the area where the three provinces of Vientiane, Xiangkhoang, and Louangphrabang adjoin (see map). This triborder region accounted for 77% of the reported attacks and 83% of the chemical-associated deaths. Most of the reported attacks took place in 1978 and 1979. Since 1979, the incidence of chemical attacks appears to have been lower, but reported death rates among unprotected and untreated victims were higher. Only seven chemical attacks were reported in the fall of 1981, for example, yet 1,034 deaths were associated with those incidents.

TABLE 1

Laos: Summary of Reported Chemical Attacks and Associated Deaths, 1975–81

Time Period	Area	Attacks[a]	Deaths[b]
Summer 1975	Vientiane	2	25+
Fall 1976	Phou Bia	8	10
	Savannakhet	1	10
Winter 1976–77	Phou Bia	2	16
Spring 1977	Phou Bia	6	66+
	Khammouan	2	1
Summer 1977	Phou Bia	6	95
Fall 1977	Phou Bia	1	25
Winter 1977–78	Phou Bia	10	1,328+
	Savannakhet	5	224
Spring 1978	Phou Bia	34	969+
Summer 1978	Phou Bia	22	664+
Fall 1978	Phou Bia	19	572
Winter 1978–79	Phou Bia	5	15+
Spring 1979	Phou Bia	36	257+
Summer 1979	Phou Bia	5	239+
Fall 1979	Phou Bia	10	56
	Xaignabouri	2	24+
Winter 1979–80	Phou Bia	4	10+
Spring 1980	Phou Bia	3	24
Summer 1980	Phou Bia	6	187+
Fall 1980	Xaignabouri	1	12
	Phou Bia	7	88+
	Savannakhet	3	1+
Winter 1980–81	Xaignabouri	2	57
	Phou Bia	4	82
	Vientiane	1	1+
Spring 1981	Houaphan	2	?
	Phou Bia	7	218
	Vientiane	1	—
Summer 1981	Phou Bia	1	?
Fall 1981	Phou Bia	4	500+
	Khammouan	3	534+
		226	6,310+

[a] This tabulation omits 35 attack sites, accounting for 194 deaths, which could not be geographically located in the reports. The totals overall were 261 attacks and more than 6,504 deaths.

[b] A plus sign indicates that the report(s) of deaths gave a minimum figure. In some cases (shown with a question mark) deaths were reported, but no number was given. Other reports (signified with a dash) gave no information on fatalities.

The medical symptoms reportedly produced by the chemical agents are varied. According to knowledgeable physicians, the symptoms clearly point to at least three types of chemical agents—incapacitant/riot-control agents, a nerve agent, and an agent causing massive hemorrhaging. The last-named was positively identified as trichothecene toxins. This was announced publicly by Secretary Haig in September 1981.

In a number of the refugee reports, eyewitnesses described attacks as consisting of "red gas" or a "yellow cloud."

Laos: Chemical Warfare Operational Areas

9

BEST COPY AVAILABLE

Red gas was considered the more lethal. A former Lao Army captain stated that the "red gas" caused the H'Mong to die within 12 hours. An employee of an international organization interviewed victims of a September 15, 1979 attack in which nonlethal rounds preceded an attack by five or six "red gas" bombs that covered a 500-meter area. Persons within 30–100 meters of the circle died in 10 minutes after severe convulsions. Others had headaches, chest pains, and vomiting but did not die.

Every qualified interrogator who systematically interviewed the H'Mong refugees concluded that they had been subjected to chemical attacks. A U.S. Government medical team returned from Thailand in 1979 convinced that several unidentified chemical warfare agents had produced the symptoms described by the refugees. This evidence was expanded by testimony from a variety of sources, including that of a Lao pilot who flew chemical warfare missions before defecting in 1979. His detailed description of the Lao, Vietnamese, and Soviet program to use chemical agents to defeat the H'Mong resistance helped dispel any lingering suspicions that the refugees had fabricated or embellished the stories. The Lao pilot described the chemical rocket he had fired as having a more loosely fitting warhead than a conventional rocket. (His account appears in Annex A.)

In 1977, a H'Mong resistance leader found a U.S. 2.75-inch rocket* with a modified Soviet warhead that fits the Lao pilot's description. Other sources reported that U.S. 2.75-inch rockets were fitted with Soviet-supplied lethal chemical warheads by Soviet and Vietnamese technicians at facilities in Vientiane as well as in Xiangkhoang and Savannakhet Provinces. Munitions storage facilities suitable for storing chemical agents and weapons have been identified in each of these provinces. The aircraft types—AN-2s, L-19s, and T-28/41s—most often reported by the H'Mong refugees as being used to deliver chemical agents have been identified as based on airfields in northern Laos throughout this period. A special Lao Air Force unit is responsible for chemical rockets. The unit is commanded by a Soviet-trained Lao and has a Soviet rocket expert attached as an adviser.

* During withdrawal of U.S. forces from Vietnam, thousands of these fell into Vietnamese hands.

Obtaining additional data for Laos has been difficult because of the nature of the fighting there. There have been few major operations. The reports reflect numerous minor engagements between the opposing forces. In nearly all cases, the chemical use reported has been directed against villages, in the absence of obvious combat operations. This lends support to the Lao pilot's claim that the Vietnamese and Lao military commands were engaged in a "H'Mong extermination" campaign.

Of particular interest are the circumstances surrounding the collection of two physical samples found to contain lethal toxins. The first was collected after a March 13, 1981 attack on a village between the villages of Muong Chai and Phakhao in the Phou Bia region. In this case, a large two-engine plane reportedly sprayed a mist of a moist, yellow, sticky substance; two villagers and all village animals died. The second sample is from Ban Thonghak, another village in the Phou Bia region, collected following an April 2, 1981 attack in which a jet aircraft reportedly sprayed a yellow substance; 24 of the 450 villagers died. In the spring of 1981, seven separate chemical attacks, resulting in 218 deaths, were reported to have occurred in this region.

It is significant that these attacks took place following a period of escalation in overall resistance activities in the Phou Bia area in the winter of 1980–81. During that period, joint suppression operations by Lao People's Liberation Army and Vietnamese Army forces had achieved only limited success, perhaps spurring both forces on to greater effort. The more intense use of chemical weapons may have been part of this effort.

Evidently the fact that chemical agents were being used in Laos was not widely known among units of the Lao Army. In June 1981, a group of refugees from a village in Vientiane Province reached Thailand and described attacks against them carried out a month earlier by helicopters "dropping poison" into their water supply. Lao field units subsequently entered the village and were surprised at the sight of many villagers still suffering from symptoms of acute poisoning. According to a villager, when the Lao military personnel saw the "small yellow grains" spread around the village, they were convinced that toxic chemicals had been used on the village and requested medical assistance for those villagers still suffering from nausea and bloody diarrhea.

In a December 15, 1981 press conference in Beijing, former Lao Health Ministry Bureau Director Khamsengkeo Sengsathit—who had defected to China—*confirmed that chemical* weapons were being used "in the air and on the ground" in Laos, killing "thousands." He asserted that the Vietnamese alone were using such weapons, keeping the matter secret from the Lao. He also stated that 3,000 Soviet advisers were in Laos and "have taken control" of the Lao Air Force, while 40,000–50,000 Vietnamese troops had "reduced Laos to the status of a colony."

Kampuchea

Since October 1978, radio broadcasts, press releases, and official protests to the United Nations by the Democratic Kampuchea leadership have accused the Vietnamese and the Hanoi-backed People's Republic of Kampuchea regime of using Soviet-made lethal chemical agents and weapons against DK guerrilla forces and civilians. DK allegations for a time were the only source of information concerning chemical warfare attacks in Kampuchea. In November 1979, however, the guerrilla forces of the Khmer People's National Liberation Front reported that the Vietnamese had attacked them with a tear gas which, from their description, resembled the riot-control agent CS. Subsequently, Thai officials, Democratic Kampuchea informants and refugees, Vietnamese Army defectors, U.S. and Thai medical personnel, officials of international aid and relief organizations, and Canadian and West European officials also have implicated the Vietnamese in the offensive use of lethal and incapacitating chemical agents in Kampuchea.

There are reports of 124 separate attacks in Kampuchea from 1978 to the fall of 1981 in which lethal chemicals caused the deaths of 981 persons (see Table 2). The mortality figure represents a minimum because some reports state only that there were deaths and do not provide a number. The earliest reports cite attacks in Ratanakiri Province, in the northeastern corner of the country (see map). Reports from 1979 to the present show the use of lethal chemicals primarily in the provinces bordering Thailand. The greatest use of chemical agents apparently has been in Battambang Province, with 51 reported incidents; Pursat Province has experienced the next highest frequency, with 25

TABLE 2

Kampuchea: Summary of Reported Chemical Attacks and Associated Deaths, 1978–81

Time Period	Area	Attacks	Deaths[a]
1978	Ratanakiri	5	?
Summer 1979	Kompong Speu	4	37
Fall 1979	Siem Reap	1	—
	Battambang	4	22+
	Pursat	2	1+
	Koh Kong	2	6+
	Kampot	1	3
	Kompong Chhnang	2	118
Winter 1979–80	Battambang	12	64+
	Pursat	5	21+
	Koh Kong	2	4
Spring 1980	Battambang	3	20+
	Pursat	8	24+
	Koh Kong	5	13
Summer 1980	Siem Reap	1	62+
	Battambang	3	23+
	Pursat	2	7
	Koh Kong	3	—
Winter 1980–81	Battambang	0	—
	Pursat	2	3
Spring 1981	Preah Vihear	1	—
	Battambang	12	163+
	Pursat	3	42+
	Koh Kong	1	—
	Kampot	1	—
Summer 1981	Battambang	3	7+
	Kompong Thom/Cham	1	—
Fall 1981	Siem Reap	16	305
	Battambang	6	16
	Pursat	3	—
	Koh Kong	1	—
	Kampot	1	—
		124	981

[a] A plus sign indicates that the report(s) of deaths gave a minimum figure. In some cases (shown with a question mark) deaths were reported, but no number was given. Other reports (signified with a dash) gave no information on fatalities.

reported incidents. These numbers are consistent with the overall high level of military activity reported in the border provinces.

A review of information from all sources provides direct and specific support for 28 of 124 reported attacks. There is, in addition, some evidence that in all reported instances some form of attack took place. This evidence includes reports of troop movements, supply transfers, operational plans, postoperation reporting, and air activity. It indicates that military activity took place at the time and place of every incident reported to involve lethal chemical agents. In some cases, it provides strong circumstantial evidence that the action involved chemical substances—for example, the movement of chemicals and personal protection equipment into the area.

There is no doubt that in late 1978 and 1979 the Vietnamese, and what later became the People's Republic of Kampuchea forces, made at least limited use of riot-control chemicals and possible incapacitating agents against both Communist and non-Communist guerrilla forces in Kampuchea. The chemicals used probably included toxic smokes, riot-control agents such as CS, and an unidentified incapacitating agent that caused vertigo and nausea and ultimately rendered victims unconscious with no other signs or symptoms.

In March 1979, during Vietnamese operations against Khmer Rouge forces in the Phnom Melai area, a Vietnamese Army private, who later defected, observed the following activities related to chemical warfare. During the fighting, all regiment (740th) troops were issued gas masks. However, the 2nd Battalion, a "border defense unit," was not issued masks. This unit was in the Phnom Melai area and was virtually surrounded by Khmer Rouge forces. At another point in the battle, the regiment's troops were ordered to don masks. The Vietnamese Army private reported that he saw two Soviets (Caucasians) fire a DH–10 (a hand-held weapon identified by the private's comrades). He was about 50 meters from the firing point. The weapon at impact, which he was able to observe from his position, gave off clouds of white, gray, and green gas/smoke. His signal unit subsequently passed a message reporting that there were 300 dead, including the unprotected Khmer Rouge and Vietnamese of the border defense forces' 2nd Battalion. The corpses reportedly had traces of white and green powder on their faces and clothes. Their faces were contorted, with eyes wide open. No blood was seen. (A H'Mong resistance leader described an incident in 1981 in which two Soviet soldiers fired a hand-held weapon that dispersed a similar lethal agent.)

Starting in February 1980, reports revealed that the Vietnamese were using 60 mm mortars, 120 mm shells, 107 mm rockets, M–79 grenade launchers filled with chemical agents, as well as munitions delivered by T–28 aircraft. According to the DK, the chemicals used were green and yellow and powderlike in appearance. In some instances the gas was described as yellow or white. The symptoms described were tightening of the chest, disorientation, vomiting, bleeding from the nose and gums, discoloration of the body, and "stiffening" of the teeth. In July 1980, the DK described artillery attacks that produced a black smoke causing itchy skin, weakness, skin lesions, and in some cases decaying skin and blisters. In December 1980, the Vietnamese were once again firing chemical artillery shells, and it was believed that poison chemicals were being brought into Thailand's border region. By March 1981, the Democratic Kampuchea forces had reported numerous attacks directed against them with lethal chemical agents and the poisoning of food and water.

U.S. analysis of contaminated vegetation samples collected within hours of a March 1981 attack showed high levels of three trichothecene toxins in a combination that would not be expected to be found in a natural outbreak in this

Kampuchea: Chemical Warfare Operational Areas

BEST COPY AVAILABLE

environment. At the levels found on the vegetation, the three trichothecenes would produce vomiting, skin irritations and itching, and bleeding symptoms. Water samples taken from the area of the same attack also contained trichothecene toxins. Control samples from nearby areas confirmed that these toxins were not indigenous to the locale. (Details on the sample analysis appear in Annex D.)

There also is ample evidence of military activity at the place and time of the acquisition of the samples. Vietnamese Army defectors described plans for multiregimental sweep operations to be conducted along the border in northwestern Battambang Province before the end of the dry season in May. Actual fighting, however, continued to be characterized by guerrilla tactics on both sides, including, according to a Vietnamese Army defector, "staging ambushes, laying minefields, and use of deception." Indeed, Democratic Kampuchean resistance forces were ordered to avoid large-scale operations and to limit combat operations to scattered sapper attacks. Such information is consistent with other reports of Vietnamese Army forces spreading toxic chemicals in streams, along roadsides, and around villages and firing toxic gas shells against enemy positions. The Phnom Melai sector, where Phnom Mak Hoeun is located, was described as an "anthill of DK activity," and actions reported during March were "sporadic firefights" around Phnom Mak Hoeun involving the Vietnamese Army's 2nd Battalion, 2nd Border Security Regiment.

In Kampuchea, as in Laos, the period of late 1980 through spring 1981 was one of intensified Vietnamese operations to suppress the resistance and break the will of the opposing forces. In July 1981, trucks loaded with blue sacks filled with white powder were being moved by the Vietnamese into the Pailin, Battambang, and Siem Reap areas. Vietnamese soldiers told villagers that the chemicals caused blindness, hemorrhaging, and vomiting.

Additional evidence was derived from blood samples drawn from victims of Vietnamese chemical use that occurred on September 19, 1981 in the Takong area. Takong is in the same general area as Phnom Mak Hoeun—that is, the central region of Battambang Province near the Thai border. Although there is no independent confirmation of the accounts of the attack, American medical personnel visiting a DK field hospital examined the victims and obtained the blood samples. Analyses of these samples suggested the use of trichothecenes. (Blood analysis results also appear in Annex D.)

According to the DK soldiers affected, the chemicals used in the September 19 Takong attack were dispersed as a gas or powder and as a poison to water. The gas or powder was released from containers by tripwires in the area of the rear forces. This description is consistent with the other reporting for this area and time.

Thailand also has been concerned about chemical attacks against its own forces and civilian population. In March 1981, one Thai died from poisons placed by Vietnamese troops, and others became ill after suffering bleeding from the nose and mouth. In May 1981, Thai forces captured two Vietnamese as they were attempting to poison the water supply in a Kampuchean relocation camp in Thailand. The poison was analyzed by the Thai and found to contain lethal quantities of cyanide. Many reports indicate that it is common practice for Vietnamese units to poison water and food used by the DK forces.

The Soviet Connection in Southeast Asia

Much of the Soviet interest in Southeast Asia is dictated by their rivalry with China and their close alliance with the Vietnamese. Regional Communist forces have been strengthened to contain Chinese influence and deter military incursions. The area of northern Laos between Vientiane and the Chinese border—where the H'Mong hill tribes have stubbornly resisted and harassed Vietnamese forces—is strategically significant to the Vietnamese because it adjoins a hostile China. In the last few years the Vietnamese have expanded their military construction and strengthened their forces in Laos which now number 50,000.

Initially there was a tendency to interpret the Soviet role as strictly advisory. Now, however, there is considerable evidence to suggest that the Soviets are far more involved in the Lao and Vietnamese chemical warfare program than was assumed earlier. An estimated 500 Soviet military advisers provide maintenance assistance and technical support, actually running the Lao Air Force, and give advanced training to Lao personnel in conventional as well as chemical warfare.

The Soviets have had advisers and technicians working in Vietnam and Laos for many years and in Kampuchea since 1979. However, it was not until early 1979 that evidence surfaced on the Soviets' direct involvement in chemical warfare activities. For example, the Lao Army chemical section in Xiangkhoang prepared Soviet-manufactured chemical items for inspection by a Soviet military team on February 7, 1979. A seven-man team of Soviet chemical artillery experts, accompanied by Lao chemical officers, inspected chemical supplies and artillery rounds at the Xeno storage facility in Savannakhet on June 1, 1979. One report stated that the Soviets would be inspecting the same chemical explosives used to suppress the H'Mong in the Phou Bia area.

In addition to this information, H'Mong accounts have described Soviet advisers and technicians participating in the preparation of the chemical weapons for the attacks on the H'Mong villages. H'Mong eyewitnesses claim to have seen "Caucasian pilots" in aircraft, and one H'Mong report states that a downed Soviet aircraft was discovered in the jungle along with a dead Soviet pilot. In November 1981, a H'Mong resistance leader described how Soviet soldiers fighting with the Lao Army fired handheld weapons that dispersed a lethal agent over a 300-meter area. Several Lao defectors have reported seeing Soviet advisers present when aircraft were loaded with chemical-agent rockets.

In July 1981, a Soviet shipment of wooden crates filled with canisters described by the Vietnamese as "deadly toxic chemicals" was unloaded at the port of Ho Chi Minh City. This incident further corroborates the judgment that the Soviets have been shipping chemical warfare materiel to Vietnam for some time. During the unloading, Vietnamese soldiers were caught pilfering the wooden crates containing the canisters. The soldiers dropped one of the wooden cases and intentionally broke it open; they wanted to determine if its contents were edible or valuable for pilferage. When a soldier broke the nylon seal and attempted to pry open a canister, special security personnel isolated the area and told the soldiers that the canisters contained deadly toxic substances from the U.S.S.R. The wooden crates, each weighing 100 kilograms, were loaded on military trucks and taken under special guard to the Long Binh storage depot.

This incident is only one in a series involving Soviet chemical warfare materiel dating back several years. In 1975, for example, a Soviet captain of a diving support craft engaged in salvaging a sunken ship in the Black Sea, which had been transporting Soviet military supplies to Vietnam, said that

his divers came in contact with toxic chemicals, and a special Soviet salvage unit took over the operation after the divers became very ill. The salvage operations, conducted by the ASPTR-12 Salvage, Rescue, and Underwater Technical Services Group based in Odessa, were monitored by high-ranking Soviet naval officers.

The operation began with the removal of tractors and helicopters which cluttered the deck of the ship and prevented access to hold hatches. Once the surface clutter was removed, the divers attempted to enter the holds. At this point, however, operations had to be suspended temporarily because of a violent outbreak of chemical poisoning among the divers. Contact with the unidentified chemicals resulted in reddish welts 1-3 centimeters in diameter on exposed skin and was accompanied by severe headaches, nausea, and a general feeling of fatigue. The symptoms disappeared on their own after 3-5 days of rest. At this point, military authorities took over from the ASPTR-12 divers, who were temporarily withdrawn from the project. Soviet naval divers were sent down and determined that the source of poisoning was chemical seepage from an open hatch of one of the holds. The hatch was promptly sealed, and the salvage operation was once more assigned to ASPTR-12 divers who resumed work and retrieved ammunition and an assortment of other equipment. Once this was done, the military took over permanently. The ship was raised without removing the poisonous chemicals and towed to an Odessa shipyard where the chemicals were unloaded by military personnel. The ship was then broken up and scrapped. The entire operation took about 2 years to complete.

As another example of Soviet involvement, two Vietnamese corporals, from the 337th and 347th Vietnamese Army divisions, have stated that Soviet-supplied chemical weapons were stored in caves near Lang Son in February 1979. Although their Vietnamese units were issued gas masks, they were told that Soviet-supplied chemical weapons would not be used unless the Chinese initiated chemical warfare. As late as February 1981, a team of uniformed Soviet military advisers was attached to the corps headquarters. The team leader was a senior Soviet colonel. The Soviets were involved in training corps personnel in the use of Soviet-supplied weapons and equipment, including chemical artillery shells and gas masks. The Soviet team often inspected defensive positions and observed training maneuvers.

Afghanistan

Attacks with chemical weapons against the *mujahidin* guerrillas in Afghanistan were reported as early as 6 months before the Soviet invasion on December 27, 1979. The information specifies that Soviet-made aircraft were used to drop chemical bombs, with no clear identification of Soviet or Afghan pilots or of the specific agents used. On November 16, 1979, chemical bombs reportedly were dropped along with conventional air munitions on targets in Farah, Herat, and Badghisat Provinces by Soviet-supplied Afghan IL-28 bombers based at Shindand. A number of Afghan military defectors have stated that the Soviets provided the Afghan military with chemical warfare training

TABLE 3

Afghanistan: Summary of Reported Chemical Attacks and Associated Deaths, 1979-81

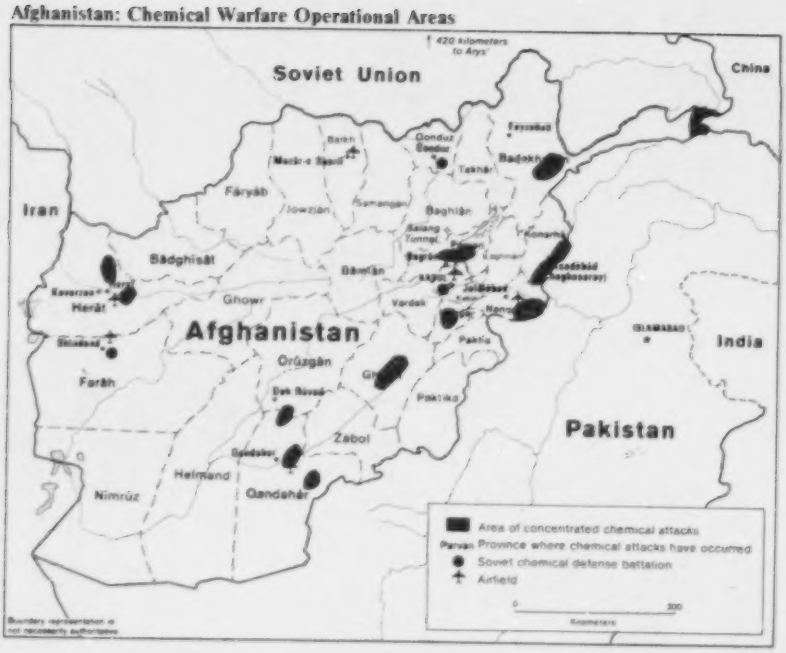
Time Period	Province	Attacks[a]	Deaths[b]
Summer 1979	Badakhshan	1	2,000[c]
	Parvan	1	6
	Bamian	1	—
Fall 1979	Konarha	1	350
	Farah	1	?
	Herat	1	?
	Badghisat	1	?
Winter 1979-80	Badakhshan	5	130+
	Takhar	1	—
	Konarha	2	10+
	Nangarhar	1	?
	Bamian	1	?
Spring 1980	Badakhshan	1	1+
	Konarha	2	?
	Oruzgan	1	—
	Qandehar	1	—
Summer 1980	Nangarhar	2	1
	Vardak	1	3
	Herat	2	300+
	Kabul	2	—
Fall 1980	Konarha	1	?
	Lowgar	1	4
	Ghazni	1	100
Winter 1980-81	Lowgar	2	?
Spring 1981	Parvan	2	—
	Lowgar	3	—
	Ghazni	2	?
	Qandehar	1	—
Summer 1981	Nangarhar	2	?
	Qandehar	2	16
	Herat	1	119
		47	3,042

[a] This tabulation omits some attacks described in the text because they could not be dated or located with high confidence.

[b] A plus sign indicates that the report(s) of deaths gave a minimum figure. In some cases (shown with a question mark) deaths were reported, but no number was given. Other reports (signified with a dash) gave no information on fatalities.

[c] The quality of reporting for this period is not as good as the information that became available after the Soviet invasion. We are concerned that this unusually high figure may reflect an accumulation of deaths from several incidents and not the single attack indicated. For example, reports were received describing over 1,000 deaths in Bamian Province in June-July 1979. An Afghan military officer reported seeing the bodies of many *mujahidin* in Panjsher Valley in August 1979 after a chemical attack and stated that many had been killed. An Afghan civil engineer reported hearing that many deaths resulted from a chemical attack in the Jalalabad area, also in the summer of 1979. Because we could not obtain supporting evidence, these reports were not included. Although sufficient evidence exists to conclude that Afghan Government forces used chemical weapons, mainly bombs, from June to December 1979, no survivors or eyewitness accounts of these attacks are available to determine the type of agent and symptoms.

Afghanistan: Chemical Warfare Operational Areas



as well as supplies of lethal and incapacitating agents.

For the period from the summer of 1979 to the summer of 1981, the U.S. Government received reports of 47 separate chemical attacks with a claimed death toll of more than 3,000 (see Table 3). Of the 47 reports, 36 came from Afghan Army deserters, *mujahidin* resistance fighters, journalists, U.S. physicians, and others. For 24 of the reported attacks, there is additional independent evidence supporting allegations of chemical attacks. In seven instances, further individual reporting exists. Evidence for 20 of the reported incidents comes from information on Soviet or Afghan Army combat operations in progress in areas and at times approximating those of a reported chemical attack (see map).

The reports indicated that fixed-wing aircraft and helicopters usually were employed to disseminate chemical warfare agents by rockets, bombs, and sprays. Chemical-filled landmines were also reportedly used by the Soviets. The chemical clouds were usually gray or blue-black, yellow, or a combination of the colors.

Symptoms reported by victims and witnesses of attacks indicate that nonlethal incapacitating chemicals and lethal chemicals—including nerve agents, phosgene or phosgene oxime, possibly trichothecene toxins, and mustard—were used. Medical examinations of some of the victims include reports of paralysis, other neurological effects, blisters, bleeding, and sometimes death. While none of the agents being used in Afghanistan has been positively identified through sample analysis, there is no doubt that the agents being used are far more toxic than riot-control agents such as CN and CS or even adamsite.

Several descriptions of the physiological action of a chemical agent or of the condition of the corpses of victims were particularly unusual. In one, victims were rapidly rendered unconscious for 2–6 hours and had few aftereffects. In another, the bodies were characterized by abnormal bloating and blackened skin with a dark-reddish tinge, and the flesh appeared decayed very soon after death. In a third incident, three dead *mujahidin* guerrillas were found with hands on rifles and lying in a firing position, indicating that the attacker had used an extremely rapid-acting lethal chemical that is not detectable by normal senses and that causes no outward physiological responses before death.

Shortly after the Soviet invasion, many reports were received that both Soviet and Afghan forces were using various types of chemical agents. Ten separate chemical attacks, resulting in many deaths, were reported in the first 3 months of 1980. These reports came from northeastern Afghanistan and provide the highest percentage of reported deaths. During the mid-January to February 1980 period, helicopter attacks were reported in northeastern Afghanistan in which a grayish-blue smoke resulted in symptoms similar to those

BEST COPY AVAILABLE

described by the H'Mong refugees from Laos (e.g., heavy tearing or watering of eyes; extensive blistering and discoloration of the skin, later resulting in large sheetlike peeling; swelling in the areas affected by the blister; and finally numbness, paralysis, and death). Medical reports from examinations in Pakistan of refugees from a large attack in the upper Konar Valley in February 1980 described red skin and blisters containing fluid described as "dirty water." Refugees estimated that about 2,000 people were affected after contact with a dirty yellow cloud.

By spring and summer of 1980, chemical attacks were reported in all areas of concentrated resistance activity. Many reports from different sources strongly support the case that irritants were used to drive the insurgents into the open to expose them to attack with conventional weapons and incapacitants to render them tractable for disarming and capture. On several occasions in April 1980, for example, Soviet helicopter pilots dropped "gas bombs" on insurgents, evidently to drive them from caves.

A Dutch journalist, Bernd de Bruin, published an eyewitness account of two chemical attacks occurring in the Jalalabad area on June 15 and June 21, 1980 (*Nieuwsnet*, August 2, 1980). He filmed an MI-24 helicopter dropping canisters that produced a dirty yellow cloud. A victim with blackened skin, discolored by extensive subcutaneous hemorrhaging, was photographed in the village 5 hours after the attack. The journalist evidently was exposed because he developed blisters on his hands and a swollen and itchy face. He also was exposed in the second attack, and it took about 10 days for him to recover from skin lesions, nausea, diarrhea, and stomach cramps.

An Afghan insurgent provided an eyewitness account of a July 6, 1980 attack on a village 10 kilometers east of Darae Jelga in Vardak Province. He reported that a Soviet MI-24 helicopter gunship dropped a bomb that, upon explosion, released a lethal chemical. A separate report confirmed that Soviet bombing attacks on villages in Vardak as well as Lowgar and Parvan Provinces were taking place during this period. In August 1980, information surfaced on a Soviet attack with chemical bombs on the village of Sya Wusan, 30 kilometers southeast of Herat, leaving 300 dead. It was during this time that the Soviet chemical battalion at Shindand set up an operational decontamination station.

Reports of chemical weapons use in 1981 essentially parallel 1980 reporting with respect to frequency and location of attack. Soviet helicopter units participated in chemical attacks from April 20 to April 29, 1981, in areas east and west of Kabul and in the Konar Valley, according to eyewitness accounts. These attacks were intended to drive personnel from sanctuaries, such as caves, in order to engage them with conventional fire. The munitions were described as Soviet 250-kilogram RBK cluster bombs. The Soviets have such a munition, which can be filled with chemical agents. Other reports described similar operations by helicopters north of Qandahar on April 24 and April 26, 1981.

A former Afghan MI-8 helicopter pilot said Soviet forces had used chemical weapons in Badakhshan, Qonduz, and Konarha. Chemicals in canisters that contained toxic gas, tear gas, and antirespiratory gas, which has an incapacitating effect by causing choking and difficulty in breathing, were manually pushed from the cargo compartment of helicopters. The pilot said that there also was a specific gas that is absorbed by the body and leaves the skin so soft that a finger can be punched through it. In one case, there was a wind shift, and Soviet and Afghan forces were seriously affected. Other sources also have described an incident where Soviet and Afghan forces were victims of their own gas attack.

The following sequence occurred in a small valley in Qandahar Province in early June 1981. According to an Afghan exile, Soviet combat groups engaged rebel forces in that valley during a 2-week period. The situation worsened for the Soviets, and an airstrike was conducted. The exile stated that a Soviet helicopter delivered a single rocket, releasing a chemical that killed 16 insurgents. Nearly all reports state that chemicals were delivered by aircraft or helicopters; a few reports describe chemical artillery rounds.

Before a sweep operation in the Konar Valley in September 1981, resistance leaders were told by an Afghan officer that the Soviets had four agents available but would use only the incapacitant which they could defend against with wet rags over the face. During the operation, Soviet helicopters conducted gas attacks in 25 different areas, using cylinders about 1.5 meters long and 60 centimeters in diameter that exploded 4–5 meters above the ground, releasing the incapacitating gas. Some victims lost consciousness, were paralyzed, and recovered, but others died, and unprotected areas of their skin turned dark green to blue-green.

An Afghan tribal leader recently described a Soviet chemical attack against a large resistance force in October 1981 near Maruf, about 100 kilometers east of Qandahar. Soviet helicopters dropped green cylindrical canisters (18 inches long, 3–4 inches in diameter) which, upon hitting the ground, emitted a greenish-yellow gas. According to the report, victims felt faint and dizzy; later their skin began to itch, and many lost consciousness. About 300 persons were affected by the gas and many died. Soviet ground forces captured many of the survivors. Other information on Soviet and *mujahidin* activities in the Qandahar area during this period confirms that this incident did in fact take place.

In February 1982, a member of the resistance, with considerable knowledge of Soviet weapons, told a U.S. official that the Soviets were using irritants, a hallucinogenic gas, and what he said was an apparent nerve gas. He described the "nerve agent" as an off-white powdery substance dispersed from helicopters generally during artillery or bombing attacks. Victims realize they have been exposed to chemical attack only when they become faint and dizzy. Subsequently, they begin to vomit and bleed from the eyes, nose, and mouth. Death occurs within a short time. The corpses are extremely relaxed, with no evidence of rigor mortis. Flesh and skin frequently peel off if an effort is made to move the bodies.

According to this account, survivors suffer aftereffects for about 6 months, including chest congestion and pain, dizziness, and mental agitation. The powder-like substance is more effective at lower altitudes where there is less wind to dilute the poison, and *mujahidin* groups have experienced fatality rates as high as 70%. Many survivors of chemical attacks in Laos and Afghanistan have exhibited the same long-term health problems described in this account.

Chemical defense battalions—standard in all Soviet divisions—are deployed with the three Soviet motorized rifle divisions operating in Afghanistan at Qonduz, Shindand, and Kabul. Soviet operational personnel decontamination stations were observed at several locations, and chemical decontamination field units were deployed during a sweep operation of the Konar Valley in eastern Afghanistan and near Shindand in the west in 1980. The operational deployment of decontamination units for personnel and equipment suggests that chemical battalions have supported offensive chemical use. In addition, Soviet personnel have been observed wearing chemical protective equipment. The Soviets have specifically tailored their forces in Afghanistan, in part

because of logistical constraints; 5,000 troops and "nonessential" combat equipment were withdrawn, but the chemical battalions remain.

A Soviet military chemical specialist, captured by the *mujahidin*, gave his name as Yuriy Povarnitsyn from Sverdlovsk. During an interview, he said that his mission was to examine villages after a chemical attack to determine whether they were safe to enter or required decontamination. An Afghan pathologist who later defected described accompanying Soviet chemical warfare personnel into contaminated areas to collect soil, vegetation, and water samples after Soviet chemical attacks. According to firsthand experience of former Soviet chemical personnel, the Soviets do not require decontamination equipment in an area where chemical bombs are stored or loaded onto aircraft. Thus, deployment of this equipment in Afghanistan must be assumed to be associated with the active employment of casualty-producing chemical agents.

Afghan military defectors have provided information on ammunition and grenades containing phosgene, diphosgene, sarin, and soman and have described where and when some of them have been used. They also have revealed locations where these agents were stockpiled. The agents used, plus the time and location of the attacks, correspond with the refugee reports and recorded military operations.

The Soviet Union has stocked a variety of toxic chemical agents and munitions to meet wartime contingencies. Weapons systems capable of delivering chemical munitions available to Soviet forces in Afghanistan include artillery, multiple rocket launchers, and tactical aircraft.

Motivation for Using Chemical Weapons

In the course of this analysis, the question has been posed: Is there a military-strategic or tactical rationale for the systematic use of chemical weapons by conventional forces in Laos, Kampuchea, and Afghanistan? The military problems faced in these countries—viewed from the perspective of the Soviets and their allies—make the use of chemical weapons a militarily effective way of breaking the will and resistance of stubborn anti-government forces operating from relatively inaccessible, protected sanctuaries.

The Soviets have made a large investment in insuring that Vietnam and its clients succeed in extending their control over Indochina. For Vietnam, the H'Mong resistance in Laos is a major irritant to be removed as quickly and cheaply as possible. The use of chemical agents has played a major role in driving the H'Mong from their mountain strongholds, relieving Vietnamese and Lao ground forces of the need for costly combat in difficult terrain. Much of the H'Mong population that lived in the Phou Bia mountain region has been driven into Thailand, killed, or resettled.

In the mountainous areas of Afghanistan, where rebels are holed up in caves or other inaccessible areas, conventional artillery, high-explosive bombs, and napalm are not particularly effective. Many reports indicate that unidentified chemical agents have been used on such targets. Caves and rugged terrain in Laos and thick jungles in Kampuchea also have frustrated attempts to locate and destroy the resistance forces. Chemical clouds can penetrate the heavy forests and jungle canopy and seep into the mountain caves. Persistent agents linger in the area and cause casualties days and sometimes weeks after the attack. Unprotected forces and civilians have little or no defense against lethal agents like toxins, nerve gas, or blister agents.

Trichothecene toxins, which are known to have been used in Southeast Asia, have the added advantage of being an effective terror weapon that causes bizarre and horrifying symptoms. Severe bleeding, in addition to blisters and vomiting, has instilled fear in the resistance villages. Not only have the villagers and their animals been killed in a gruesome manner, but the vegetation and water also have been contaminated. Survivors are reluctant to return to their inhospitable homes and instead make the long and dangerous trek to camps in Thailand.

There is no clearcut explanation of why trichothecene toxins have been used in addition to irritants, incapacitants, and other traditional chemical warfare agents. Speculation suggests that they are probably cheaper to make and are readily available from Soviet stocks; they are probably safer and more stable to store, transport, and handle in a Southeast Asian environment, and they may require less protective equipment when being prepared for munitions. They are difficult to trace as the causative agent after an attack—as demonstrated by the length of time it took for the United States to detect them. Few laboratories in the world have the analytical capability to identify precisely the type and amount of trichothecene toxin in a sample of vegetation, soil, or water.

The Soviets may well have calculated that they and their allies could successfully deny or counter charges that chemical weapons had been used, recognizing that it would be especially difficult to compile incontrovertible evidence from inaccessible areas of Southeast Asia and Afghanistan. With respect to Kampuchea, they may also have calculated that, in view of the lack of international support for Pol Pot's resistance, chemical weapons could be used on his troops without significant international outcry.

In addition, the Soviet military very likely considers these remote areas as providing unique opportunities for the operational testing and evaluation of chemical weapons under various tactical conditions. Years of aerial and artillery chemical dispersion have undoubtedly provided the Soviets with valuable testing data. Southeast Asia has offered the Soviets an opportunity to test old agents that had been stockpiled for many years as well as more recently developed agents or combinations of agents. This conclusion is supported by information from foreign military officers who have attended the Soviet Military Academy of Chemical Defense in Moscow. According to their Soviet instructor, three types of chemical agents may be used during the "initial stages" of local wars: "harassing agents (CS, CN, DM), incapacitants such as psychochemicals (BZ) or intertoxins [sic—possibly enterotoxins], and herbicides." During the "decisive phase, lethal agents can be employed under certain circumstances." In a local war, "chemical weapons can be used to spoil enemy efforts to initiate operations, even if the enemy has not used them first." The foreign officers' accounts, including detailed descriptions of the Soviet chemical warfare program, support the conclusion that the Soviets consider chemical weapons an effective and acceptable means of warfare in local conflicts.

Insight into the Soviet bloc military perspective on the use of toxins is provided in the following passage from a 1977 East German military manual entitled *Textbook of Military Chemistry*.

> Toxins are designated as toxic agents which are produced by biological organisms such as micro-organisms, plants, and animals, and cannot themselves reproduce.
>
> By the middle of 1960 the toxins selected for military purposes were included among the biologic warfare agents. In principle, this was understood to mean only the bacterial toxins. Today it is possible to produce various toxins synthetically. Toxins with 10-12 amino acids can currently be synthesized in the laboratory. Toxins are not living substances and in this sense are chemicals. They thus differ fundamentally from the biological organisms so that they can be included among chemical warfare agents. As a result

of their peculiarities they are designated simply as "toxin warfare agents." They would be used in combat according to the same principles and with the same methods used for chemical warfare agents. When they are used in combat the atmosphere can be contaminated over relatively large areas—we can expect expansion depths of up to 6 kilometers before the toxin concentration drops below lethal concentration 50 . . . the toxin warfare agents can be aerosolized. They can be used primarily in micro-bombs which are launched from the air or in warheads of tactical rockets. Toxin warfare agents concentrates can be applied with aircraft spray equipment and similar dispersion systems.

The Soviet designation for several pathogenic *Fusarium* products is "IIF (*iskusstvennyy infektsionny fon*), which stands for "artificial infection background." IIF devices are used in the Soviet Union deliberately to contaminate soil in experimental agricultural test areas with spores of disease-producing fungi. We are not certain if the IIF compounds include trichothecenes. Nor are we certain as to the intent of this agricultural research program. It is possible that these programs are designed to colonize soil with pathogenic organisms either to determine which crop varieties are most resistant to disease or, alternatively, to test eradication and control methods in infected soils. Elsewhere in the Soviet agricultural research program, however, it is known that there is widespread use of certain trichothecenes, including sprays from light aircraft. A capability exists within the Soviet Union for multi-ton production of light aircraft spray-delivered microbial products such as those described above.

Evidence accumulated since World War II clearly shows that the Soviets have been extensively involved in preparations for large-scale offensive and defensive chemical warfare. Chemical warfare agents and delivery systems developed by the Soviets have been identified, along with production and storage areas within the U.S.S.R. and continuing research, development, and testing activities at the major Soviet chemical proving grounds. Soviet military forces are extensively equipped and trained for operations in a chemically contaminated environment. None of the evidence indicates any abatement in this program. The Soviets have shown a strong interest in improving or enhancing their standard agents for greater reliability and effect. Their large chemical and biological research and development effort has led them to investigate other kinds of chemical warfare agents, particularly the toxins.

None of the four countries considered in this report—Vietnam, Laos, Kampuchea, and Afghanistan—has any known large-scale facility or organization for the manufacture of chemical and biological materials. Nor are they known to have produced even small quantities of chemical warfare agents or munitions. The technical problems of producing large quantities of weapons-grade toxins, however, are not so great as to preclude any of the four countries from learning to manufacture, purify, and weaponize these materials. It is highly unlikely, however, that they could master these functions without acquiring outside technical know-how.

ANNEX A

A Lao Pilot's Account

One of the most complete descriptions of chemical warfare activities in the 1976–78 period came from a Lao pilot who was directly involved in chemical warfare. The pilot, a former Lao People's Liberation Army (LPLA) officer who defected in 1979, reported that he flew captured L–19 and T–41 aircraft equipped to dispense toxic chemical agents on H'Mong villagers in the Phou Bia area of northern Laos. He said that the LPLA, in cooperation with the Vietnamese Army, had conducted chemical warfare operations in Laos since April or early May 1976. At that time, two Lao H–34 helicopters were flown between Long Tieng and the Phonsavan airfield, both in Xiangkhoang Province, on a series of flights to transport rockets to Phonsavan for storage.

Between June and August 1976, the LPLA launched attacks in the area of Bouamlong—in Xiangkhoang Province—a stronghold for remnants of the forces of former H'Mong Gen. Vang Pao. The LPLA used L–19 aircraft for rocket attacks in that area aimed at eliminating the H'Mong resisting government control. Lao crews responsible for loading rockets on the attack aircraft noted that they were not allowed to use the rockets that had been moved from Long Tieng to Phonsavan, even though Phonsavan was much closer to the Bouamlong target area than Long Tieng, where Lao aircraft had to rearm. The pilot said that, during nearly 3 months of flying missions against the Bouamlong area, he flew his L–19 aircraft to Long Tieng to be armed with rockets.

In late 1976, the pilot's L–19 aircraft was rearmed with rockets stored at Phonsavan. Initially, H–34 helicopters were used to transport the rockets from Phonsavan to a depot near the Ban Xon airfield (Vientiane Province), where the rockets were fitted into racks of the L–19 aircraft for missions in the Phou Bia area; later, the rockets from Phonsavan were transported to Ban Xon by trucks. All U.S.-manufactured rockets were stored with the tip and canister kept apart; the two parts had to be joined before being fitted to the racks on the aircraft. The pilot observed, however, that all the rockets transported from Phonsavan to Ban Xon were already assembled.

As part of his routine flight activities, the pilot would check his aircraft and, in doing so, examine the tip portion of new smoke rockets that had been transported from Phonsavan. He said that most appeared "loose" in the portion where the tip and canister joined, whereas the tip and canister of the ordinary explosive-type rockets at Long Tieng were noticeably more tightly connected.

In late 1976, during preparation for airstrikes on Kasy (Louangphrabang Province) and in new areas of Phou Bia, the pilot said he began carrying two or three Vietnamese Army staff officers, sometimes accompanied by a Lao staff officer, in T–41 aircraft for reconnaissance over the target areas. When these airstrikes were launched, the defector pilot initially flew his L–19 aircraft on missions with another pilot and a Lao staff officer. After 2 or 3 weeks, however, Vietnamese staff officers, who spoke excellent Lao, began alternating with the Lao officers. Before each mission, the Vietnamese or Lao staff officer would go over target areas outlined on situation maps—which then were taken along—and would point out the targets to be attacked. The defector pilot noted that at no time did the Vietnamese staff officer communicate with Lao officers on the ground, as did the Lao staff officers. A new Vietnamese officer was assigned for each airstrike mission in the H'Mong areas.

The pilot related that before flying L–19 airstrike missions with a full load of rockets he was often warned by a Lao commander to fly at above-normal altitudes when firing rockets—to preclude hazard to the occupants of the aircraft. For this reason the pilot surmised that the "smoke" rockets fired at the H'Mong were unusual. He was able to observe that the "smoke" rockets detonated in the air and that some produced white smoke, with a mixture of blue, while others produced red smoke, with a mixture of yellow. The ordinary explosive-type rockets detonated on impact. The

commander or his designated representative told the pilot before every mission that the operations—called Extinct Destruction Operations—were intended to "wipe out the reactionary H'Mong people."

Before a mission involving "smoke rockets," the commander warned the pilots to keep the operation secret. The Lao defector said that, during the nearly 2 years in which he flew rocket missions, he learned from the Lao staff officers accompanying him that there were two types of rockets. The first, mostly "smoke" rockets, were to be fired at targets far away from Lao and Vietnamese troops to avoid exposing them to the poison smoke. The second was of the ordinary explosive type, considered a "close support" rocket that could be fired near Lao troop positions. Initially, the L–19 aircraft carried eight rockets—five "close support" and three "smoke" rockets. Later, only four rockets, mainly of the "smoke" type, were carried.

After each mission in which chemical warfare rockets were used, the pilot was returned to a "rest house" at Phonsavan, where a Lao Army doctor and nurse would examine him. He said that after his missions, especially in 1978, he was particularly well treated by the examining doctor and watched very closely by the nurse. Those L–19 aircraft pilots assigned to missions utilizing chemical warfare rockets had special privileges, including additional flight pay and free meals at the Phonsavan cafeteria. In October 1978, the Lao Army stopped using L–19 aircraft on combat missions and began using Soviet MiG–21s for chemical attacks on the Phou Bia areas.

Several H'Mong reports corroborate the testimony of the Lao pilot. A village chief, for example, described attacks covering all 7 days of the week of June 5, 1976 in the Bouamlong area. He described L–19 aircraft firing rockets that produced red and green smoke: Ten villagers were killed by gas and 30 by shrapnel. Most of the H'Mong reports documented by a U.S. Foreign Service officer in June 1979 and a Department of Defense medical team in October 1979 were consistent with the pilot's testimony. H'Mong observers familiar with military aircraft reported L–19s in use until late 1978. After that time, reports described jets or "MiGs" and some accurately described Soviet AN–2s.

A review of information back to 1975 shows L–19 and T–28 aircraft were operating from airfields in northern Laos—including the one at Phonsavan, where AN–2s were seen in 1978. Failure to observe chemical decontamination equipment at the airfields does not rule out the presence or handling of chemical munitions. The Soviets supervise the chemical warfare activities in Laos; it is assumed that chemical munitions are handled in about the same manner as in the U.S.S.R. According to former Soviet chemical warfare personnel, no protective clothing or special decontamination equipment is required for loading chemical bombs onto aircraft and helicopters at chemical munitions test ranges.

The Lao pilot's description of the rockets used on the L–19 was corroborated by other sources. A H'Mong refugee, a former commander of a 500-man resistance force, reported that in 1977 he found a rocket canister and a separated warhead that he believed were the kinds used by the Vietnamese and Lao. The canister had authentic U.S. markings identifying it as a U.S.-manufactured 2.75-inch rocket and, reportedly, three lines of Russian writing which he could not translate. Another H'Mong resistance force officer, reportedly trained as a liaison officer and ordnance expert before the Communist takeover of Laos, stated that he, too, believed that the rocket canister was of U.S. manufacture and that the Soviet technicians in Laos had modified the upper stage to contain a poisonous (i.e., lethal) chemical.

The diameter of the warhead was reported to be 12.5 centimeters (5 inches), probably a measurement taken on a modified warhead, because the United States does not have a 5-inch warhead for the 2.75-inch "rocket motor." During the Vietnam conflict, about 35 million U.S.-manufactured, conventional 2.75-inch rockets were sent to the war zone, and many tens of thousands of these fell into North Vietnamese hands when the South Vietnamese forces collapsed. The Vietnamese may be using some of these rockets with existing loads, but modified warheads for the 2.75-inch rocket motor could easily be fabricated in Vietnam and filled with a lethal or nonlethal agent in Laos, especially with Soviet assistance. According to U.S. experts, fabrication of a warhead 5 inches in diameter, necked down to fit the 2.75-inch rocket, could be accomplished by trained technicians in a small, well-equipped machine shop and laboratory.

ANNEX B

Findings of U.S. Government Investigative Teams: Use of Chemical Agents Against the H'Mong in Laos

State Department Team

In May 1979, State Department officials visited Thailand to interview H'Mong refugees and investigate allegations of the use of chemical agents against H'Mong tribesmen in Laos (see Table B–1). From the signs/symptoms described and observed, it is suggested that at least two and possibly three different chemical agents may have been used, such as:

- A nerve agent (five or six individuals reported symptoms that could be attributed to a nerve agent);
- An irritant or riot-control agent (one-third of the interviews); and
- More than half of the interviews indicated such a variety of signs and symptoms that it is difficult to attribute them to a single known agent.

It is possible that in some cases two or more agents were combined.

- Reported signs and symptoms suggesting a nerve agent include sweating, tearing, excessive salivation, difficulty in breathing, shortness of breath, nausea and vomiting, dizziness, weakness, convulsions, and death occurring shortly after exposure.
- Reported signs and symptoms suggesting a riot-control or irritant agent include marked irritation or burning of the eyes, with tearing and pain; irritation and burning of the nose and throat; coughing; burning and tightness in the chest; headache; and nausea and vomiting in a few cases.
- Reported signs and symptoms not related to any known single agent include a mixture of the above as well as profuse bleeding from mucous membranes of the nose, lungs, and gastrointestinal tract, with rapid death of the affected individuals in some instances.

Estimates from the H'Mong interviewed indicate that approximately 700–1,000 persons may have died as a result of the use of chemical agents and that many times this number became ill. It was reported that on many occasions entire villages were devastated by these agents, leaving no survivors.

In the episodes described, most of the animals exposed to the chemical agents were killed. Generally, all

chickens, dogs, and pigs died and, to a lesser extent, the cattle and buffalo. On several occasions it was reported that where these agents settled on tree and plant leaves, many small holes appeared in the leaves within 2 or 3 days. Rarely did agent exposure result in the defoliation or death of the plants.

Department of Defense Team

From September 28 to October 12, 1979, a team from the U.S. Army Surgeon General's Office was in Thailand to conduct a similar series of interviews.* The team visited the following H'Mong refugee camps of northern Thailand: the detention center at Nong Kai, the large H'Mong camp at Ban Vinai, and two smaller camps at Nam Yao and Mae Charim. As the great majority of refugees as well as the H'Mong leadership are at Ban Vinai, most interviews were obtained there.

The team was prepared to obtain blood and skin samples (for cholinesterase activity and study of pathological changes, respectively) from those exposed to chemical agents. For such samples to yield meaningful results they must be taken within 6–8 weeks of exposure. Since the last reported exposure was in May 1979, no blood or skin samples were collected.

Interviews were conducted through interpreters; one was an employee of the U.S. Consulate at Udorn, and the remainder were hired from among the refugees. The interpreters screened those refugees who volunteered to talk to the team and selected only those who had been eyewitnesses to or had themselves been exposed to an agent attack. Team members interviewed 40 men, 2 women, and a 12-year-old girl. Each interview took 1–2 hours. To insure conformity, a prepared questionnaire was used as a guide.

The chemical attacks reportedly occurred between June 1976 and May 1979 (Table B–1). The absence of reports of attacks after May 1979 may be because

* The authors of the U.S. Army Surgeon General's report are Charles W. Lewis, M.D., COL, MC, Chief, Dermatology Service, Brooke Army Medical Center, Fort Sam Houston, Texas; Frederick R. Sidell, K.D., Chief, Clinical Resources Group, U.S. Army Biomedical Laboratory, Aberdeen Proving Ground, Md.; William D. Tigertt, M.D. (Brigadier General, Ret., USA), Professor of Pathology, University of Maryland, Baltimore, Md.; Charles D. Lane, LTC, Southeast Asia Desk Officer, OACSI, Department of the Army, Washington, D.C.; and Burton L. Kelley, SP5, USA, Dermatology Technician, Brooke Army Medical Center, Fort Sam Houston, Texas.

TABLE B–1

Reports of Probable Chemical Agent Attacks in Laos

Department of State Interviews Conducted in Summer 1979

Date	Location	Method of Attack by Plane	Material Used (Smoke/Gas)
Oct. 1977	Phu Hay, S. of Phou Bia	Rockets	Yellow-gray
1978	Pa Sieng, S. of Phou Bia	Bomb	Yellow
Feb. 1978	Ban Nam Luk, S. of Phou Bia	Spray (?)	Yellow/white
Feb. 1978	20 kms SE. of Phou Bia	Spray (?)	Yellow
Feb. 1978	Ban Ko Mai	Bomb	Yellow
Mar. 1978	Pha Houai	Sacks, burst in air	Brown
Mar. 1978	Ban Na Pong	(?)	Yellow
Apr. 1978	Ban Phamai	(?)	White, green, blood-colored
May-Apr. 1978	Ban Nong Po	Cloud	Yellow-brown like rain
June 1978	Ban Nam Teng	Rocket (?)	Yellow
June 1978–May 1979	Ban Don area	Spray	Yellow
Mid-1978	1–3 kms NE. of Phou Bia	Rocket, air burst	Red
Oct. 1978	Nam Kham	Rockets, air burst	Yellow
Oct. 1978	6 kms N. of Phou Khao	Rockets, air burst	Red
Oct. 1978	3–4 kms N. of Phou Bia	Rockets, air burst	Yellow-gray
Nov. 1978	Phou Xang Noi	Spray	Yellow, blue
Nov. 1978	near Phou Bia	Bomb, air burst	Yellow
Nov. 1978	NE. of Pha Khao	Rocket, air burst	Yellow
Apr. 1979	Ban Noua Pong	Spray	Yellow
May 1979	Nam Po	Spray	Yellow
May 1979	Pha Mai	Spray, air burst	Yellow

Department of Defense Interviews Conducted in Fall 1979

Date	Location	Method of Attack by Plane	Material Used (Smoke/Gas)
June 1976	Pou Mat Sao	Rockets	Red, green
Jan. 1977–Oct. 1978	Pha Khao	Rockets	Yellow, red, green
Mar. 1977	Nam Theuna	Rockets	Red, yellow
Apr. 1977	Houi Kam Lang	Rockets	Yellow
May 1977	Pha Khae	Rockets	Red
May 1977	Nam Moh	Rockets	Yellow
May 1977	Pha Ngune	Spray/rockets	Yellow
1977–1978 (3 attacks)	Phu Seu	Rockets	Red, green, yellow
Jan. 1978	Houi Xang	Rockets	Red, green
Feb. 1978	Sane Mak Ku	Rockets	Yellow
Feb. 1978	Tham Se Sam Leim	Rockets	Yellow, black
Feb. 1978	Kio Ma Nang	Rockets	Yellow
Mar. 1978	Mouong Ao	Rockets	White
Mar. 1978	Khieu Manang	Rockets	Green
Apr. 1978	Tha Se	Rockets	White
June 1978	Pha Phay	Rockets	Yellow
June 1978	Phou Seng	Rockets	Red, white, black
July 1978	Phou Bia	Rockets	Red
July 1978	Ban Nam Mo	Spray	Yellow
July 1978	Phou Lap	Rockets	Yellow
Aug. 1978	Pha Houai	Rockets	Red, green
Aug. 1978	Ban Thin On	Rockets	Green, red
Aug. 1978	Bouamlong	Rockets	Red, green, yellow
Sept. 1978	Pha Koug	Rockets	Yellow
Sept. 1978	Ban Nam Tia	Spray/rockets	Yellow, green, red
Sept. 19..	Pha Na Khum	Rockets	Red
Oct. 1978	Phou Bia	Rockets	
Oct. 1978	Ban Done	Spray	Yellow
Oct. 1978	Phou Bia	Rockets	White, green, red
Nov. 1978	Phou Bia	Rockets	White, red
Feb. 1979	Pha Mat	Spray	Yellow
Feb. 1979	Tong Moei	Rockets	Yellow, red
Mar. 1979	Pha Mai	Spray	Yellow
Mar.–May 1979 (6 attacks)	Pha Mai	Spray	Yellow
Apr.–May 1979 (4 attacks)	Pha Mai	Spray	Gray-white
May 1979	Phou Bia	Spray	Yellow
May 1979	Moung Phong	Rockets	Red

few refugees crossed the Mekong River after that time—as a result of heavy rains and flooding from June to September 1979. Most of the early reports were of the use of rockets releasing the agent; beginning in the fall of 1978, the majority of the attacks were carried out by aircraft spraying a yellowish substance which "fell like rain." The attack sites, concentrated around the H'Mong stronghold in the mountainous Phou Bia area, also are listed in Table B–1.

The team was given a plastic vial containing pieces of bark, stained by a yellow substance, which several H'Mong refugees claimed was residue from an aircraft spray attack in April 1979. Preliminary chemical analysis of the sample indicates that no standard chemical agent (i.e., an agent listed in TH 8–285, U.S. Army, May 1974) was present.

Conclusions

The conclusions of these teams, based upon interviews obtained from H'Mong refugees, are as follows:

- Chemical agents have been used against the H'Mong.
- The reported effects of these agents suggest the use of a nerve agent, a riot-control agent, and an unidentified combination or compound.

ANNEX C

Medical Evidence

Southeast Asia

Since 1975, many different sources—refugees, relief workers and medical personnel, including specially qualified physicians—consistently have detailed unusual signs and symptoms of victims of "yellow rain." Specifically, victims in Southeast Asia subjected to a direct attack of the yellow powder, mist, smoke, or dust would be seen to begin retching and vomiting within minutes. These effects and those described below were not pronounced in individuals even 100 meters from the attack zone, indicating a relatively dense chemical/carrier combination that was effective in low wind conditions.

Following the victim's exposure to yellow rain, the initial induced vomiting—unlike that caused by a traditional riot-control nausea agent—was protracted over hours to days. It was often accompanied by dizziness, rapid heartbeat and apparently low blood pressure, chest pain, loss of far-field vision, and a feeling of intense heat and burning on the skin, although not described as being most acute in the groin and axillae. Thus, the acute signs and symptoms match some effects of traditional vomiting and blister agents but clearly not all.

Within the first hours after the attack, many victims also reported intense red eyes, bleeding gums, convulsions or more often trembling, and vomiting of blood, with or without production of copious amounts of saliva—lasting many hours to days, apparently depending on the exposure level. Thick mucous, pinpoint pupils, respiratory collapse, prolonged spasticity, and involuntary urination or defecation were never reported after a yellow rain attack; the absence of these symptoms helped to rule out organophosphate nerve agents in the minds of chemical warfare experts. Many medical and environmental samples also ruled out these and other traditional agents such as DM, DS, and others.

Many observers of "yellow rain" effects reported formation within several hours of small (1 centimeter) homogeneous, hard, fluid-filled blisters over only exposed areas of skin, frequently including the victim's hands, arms, entire throat, and face—wherever skin was uncovered. In most cases the vomit, after 2–8 hours, contained blood and, in many cases, large amounts of it. About half of those receiving the most concentrated doses of yellow material—those who had been directly under the spray—were observed within several hours to cease vomiting temporarily. This interval was often followed in 5–15 minutes by a period of great pain when the victim would hold his abdomen and emit a gush of blood from mouth and nose. These individuals usually died within minutes afterward.

Close questioning by physicians of witnesses to these final moments leaves no doubt that the effects resulted from severe gastrointestinal bleeding, significant pulmonary bleeding, temporary compression of accumulated blood in the stomach, and, finally, projectile vomiting of as many as several hundred milliliters of blood. These findings were consistent with animal and human autopsies.

Many victims of the yellow material received less than the full brunt of a spray, entered the attack zone several hours to 2 days later, or consumed food or water contaminated by the material. These individuals—often within the next 24 hours—developed signs and symptoms similar to those more directly affected but often without pronounced skin effects if they had not contacted the powder residue directly. In addition to attacks of intense vomiting five or six times a day, they also had diarrhea, with bloody stools passed up to eight times a day. Bleeding under the fingernails and around the skin of the eyes and severe bruising of the skin also were commonly reported. Opiates helped the fluid loss in adults, but in children or young persons unable to tolerate the treatments of raw opium and water, death occurred after 10 days to 2 weeks in about half the cases. On the basis of reported signs and symptoms, the cause of delayed death almost certainly was dehydration.

In many cases, chemical attacks are reported to produce symptoms other than those described here. However, there has always been a direct association of the above symptoms with reports of yellow rain attacks—that is, when yellow material is used these symptoms appear; other agents may give rise to other symptoms. Although it is possible to exhibit one or even several of these symptoms associated with traditional chemical warfare agents, no expert has been able to fit the sequence, severity, and consistency with any of them. In many cases, victims and observers were examined, histories taken, and interviews conducted by several health professionals weeks apart. Remarkable consistency has been observed.

From the beginning of the yellow rain episodes in 1975, autopsies occasionally have been reported anecdotally. Some have been done inexpertly, some by nonphysicians, and some were performed on animals rather than on human victims. However, the consistency of the early reported "putrefaction" or "rottenness" of the digestive tract within 12–48 hours after death led many forensic medical experts to suspect that one effect of the poison—whatever it was— was to cause necrosis (cell death) of rapidly dividing mucosa (mucous membranes), especially in the stomach and upper small intestine. Other autopsy findings included hyperemia (engorgement with blood) of digestive mucosal linings and remarkably intense congestion and swelling in the lungs, liver, spleen, and sometimes the kidneys. These and other findings often led experts in toxicology and pathology, on the basis of clinical and pathological data alone, to suggest mycotoxin or even trichothecene intoxication.

Trichothecene effects have been reported in the forensic, oncological, and toxicological literature for several years. Unpublished findings often have been discussed in symposiums. In several dozen cases, toxic effects in humans and

animals have been carefully recorded, and they match those of yellow rain with good precision (see Table C-1). *There are no additional signs or effects of known trichothecene intoxication not frequently reported by victims, nor are there any reported yellow rain symptoms that cannot be explained by the effects of the four specific trichothecene toxins found in the samples.*

There are no significant medical differences in the reporting from Laos and Kampuchea. Although the timing and delivery systems have sometimes varied, the effects of the chemical agent, clinically and pathologically, are identical. In some cases, a series of blood samples from Kampuchean victims also showed a trend toward leukopenia (reduction in the number of white blood cells) and the presence of a trichothecene metabolite (HT-2) consistent with trichothecene intoxication (see Annex D). Dose-response effects that were observed and routes of administration were both consistent with effects of trichothecenes.

An early hypothesis (1978–79) was that a significant number of deaths, especially in Laos, could be explained by the heavy use of riot-control agents such as CS, CN, DM, and agents which cause itching and/or blistering. This hypothesis was rejected quickly on two grounds. First, trace contaminant analysis failed to show the presence of any of these compounds in samples; several samples did, however, contain a trichothecene precursor. Second, contrary to commonly held views, the epidemiology of diseases endemic to the central highlands of Laos and the public health situation of the H'Mong do not support the view of malnourished, disease-ridden, and weak persons who would succumb easily to riot-control agents. Also, many studies have shown the opposite: a relatively low incidence of pulmonary disease, lower than what could otherwise account for certain effects; better nutritional states than could otherwise account for death in 10 days to 2 weeks from water loss (dehydration) and calorie depletion; and a death rate of nearly zero from causes other than infection, old age, and trauma.

TABLE C-1

Comparison of Reported "Yellow Rain" Effects With Known Trichothecene Effects

Yellow Rain Reports*	Effects of Trichothecenes
1. Nausea, vomiting—severe, immediate	1. Nausea, vomiting—severe, immediate
2. "Falling down, world turning"	2. Dizziness
3. "Burning of skin"—small blisters	3. Generalized erythema with a burning sensation of skin
4. "Shaking all over, flopping like fish out of water"	4. Ataxia (failure of muscular coordination), occasional tremors and convulsions
5. "Bleeding eyes"	5. Congestion of the sclera (white outer coat of eyeball) and blood in tears
6. "Pounding" chest, rapid heartbeat, weakness	6. Hypotension (abnormally low blood pressure) with secondary rise in heart rate
7. Severe pain in center of chest	7. Angina (substernal chest pain)
8. Sleepiness, "not able to talk"	8. Somnolence, central nervous system symptoms
9. Bleeding gums and profuse salivation	9. Stomatitis (inflammation of oral mucous membranes) and ptyalism (excessive salivation)
10. "Can't breathe"	10. Shortness of breath
11. "Skin and body hot with cold"	11. Fever and chills
12. Diarrhea with blood	12. Diarrhea with blood
13. Loss of appetite, inability to eat	13. Anorexia
14. Bleeding into skin and fingernails	14. Thrombocytopenia (decrease in number of platelets, white blood cells involved in clotting of blood) and purpura (skin discoloration caused by hemorrhage into tissues)
15. Drop in white blood cell count	15. Leukopenia and anemia
16. "Rotten esophagus, stomach, intestines; soft spleen and liver"	16. Rapid necrosis of linings of gastrointestinal tract; lymphoid necrosis in spleen and liver
17. Swelling of all organs	17. Congestion of all organs

* Effects are immediate at levels near to or above a rough estimate of 500–1,000 mg total body burden for an adult. Although inhalation data are pending, the levels are consistent with reported lethal and sublethal doses. Trichothecenes in combination, when directly ingested or inhaled, or in purified form, are more toxic in lower concentrations, and the order of signs and symptoms and timing varies.

Afghanistan

Some deaths associated with bleeding have been described in the accounts from Afghanistan. In one set of cases, a physician examined persons who had been exposed to sublethal doses of a yellow smoke/black smoke combination attack and one man near death after a series of attacks. Hemoptysis (nasal bleeding)—but not hematemesis (bleeding from the gastrointestinal tract)—was reported in about half of these cases.

Several features of at least one of the chemical agents—an incapacitant—used in Afghanistan defy explanation at this time. One possibility is that the agent(s) are highly selective for the central nervous system rather than the autonomic nervous system. As yet, no good candidate agent has been identified which will selectively inhibit the central nervous system so as to cause unconsciousness for several hours. Another finding has been the presence of a dermal anaesthesia, affecting only exposed areas of skin.

Postattack Medical Survey

There is evidence that after some attacks in Laos and Afghanistan, Lao Communist or Soviet forces entered the attack zones to conduct surveys. Several reports indicate that survivors from a toxin attack on a Lao village were taken several kilometers from the village and injected with a small volume of a clear solution said by their captors to be a "new" medicine to assess the gas. The injections, given intramuscularly in the upper arm, reportedly did nothing to

alleviate the weakness, nausea, vomiting, or diarrhea suffered by the survivors. One victim reported the drug caused an immediate sensation of warmth throughout his body. Only the use of opium later eased the discomfort. It is probable that this procedure was a test either of a new antidote or of a drug developed to reduce incapacitation from the nausea and vomiting.

Similarly, in a few cases in Afghanistan, Soviet troops reportedly disembarked from helicopters or armored personnel carriers at the edge of an attack site. Three or four, dressed in full anti-contamination gear, walked among the dead, examined the corpses and, opening them with a crude incision, examined the organs in the abdominal and thoracic cavities. In one case, a solution was poured into the incision. When the corpses were later recovered by the *mujahidin*, the body cavity contents had been destroyed beyond recognition. These and a few additional reports support the hypothesis that the perpetrators of some of the attacks were interested in studying aftereffects, lethality, or some other quasi-experimental aspect of the use of a new chemical weapon. Recent indications from Afghanistan indicate that one purpose of the field surveys and body examinations is to determine levels of toxic materials still present in the attack zone before Soviet troops occupy it.

ANNEX D

Analysis and Review of Trichothecene Toxins

Sample Analyses for Trichothecenes

The Trichothecene Hypothesis. Since 1975, the U.S. Government has received remarkably consistent reports detailing chemical attacks in Southeast Asia. Some of these reports described the use of lethal agents which produced symptoms that could not be correlated with those produced by known or traditionally recognized chemical warfare agents or combinations of them (see Table D–1). It is readily apparent that the symptoms most frequently described in Laos and Kampuchea correspond most closely with those produced by a group of mycotoxins—the trichothecenes. A review of the scientific literature revealed not only that these compounds had physical and chemical properties indicating potential as chemical agents but also that they were the subject of intensive investigation by Soviet scientists at institutes previously linked with chemical and biological warfare research. In the fall of 1980, the trichothecenes were added to the list of agents suspected to have been used in Southeast Asia and Afghanistan. Other candidates under consideration included phoegene oxime, arsines, cyanogen chloride, nerve agents, riot-control agents, and combinations of these agents.

Many samples from chemical attacks in Laos and Kampuchea were examined at the U.S. Army's Chemical Systems Laboratory (CSL) for the presence of traditional chemical warfare agents and were reported to be negative. In March 1981, CSL reported the presence of an unusual compound ($C_{15}H_{24}$) in the vapor analyses from several clothing and tissue samples taken from the victim of a chemical attack. The compound was closely related in structure to the simple trichothecenes. This finding sparked the request for analysis of all future samples for the presence of trichothecene mycotoxins.

The Kampuchean Leaf and Stem Sample: The First Analysis for Trichothecenes. On March 24, 1981, a number of samples were received from the U.S. Embassy in Bangkok. Two were reported to have been collected from the site of a chemical attack that occurred in the vicinity of TV 3391, an area just south of Phnom Mak Hoeun. A vegetation sample and a water sample were collected within 24 hours of the attack. Examination of bodies of victims of this attack by medical personnel revealed highly unusual degeneration of the mucosal lining of the gastrointestinal tract. The effects described paralleled those known to be produced by the trichothecenes. The samples were submitted to the Chemical Systems Laboratory for analysis for the presence of chemical warfare agents. With the exception of the unusual presence of high levels of CN-, Cl-, and F-ions, no evidence of known chemical warfare agents was found. An initial test for the trichothecenes by thin layer chromatography was inconclusive because of severe problems with interfering substances and the lack of appropriate standards.

The trichothecenes are difficult to detect even under ideal circumstances, and the presence of interfering substances in the sample may make identification and quantification by thin layer chromatography inconclusive. A review of the limitations and potentials of the analytical methods for trichothecenes led to the conclusion that the computerized gas chromatography/mass spectroscopy method in the selected ion-monitoring mode enabled precise identification and quantification of these compounds in complex mixtures. A comparison of the currently available methods suitable for trichothecene analysis and an assessment of their utility and limitations is presented in Table E–3.

A portion of the leaf and stem sample was furnished to the U.S. Army Medical Intelligence and Information Agency for further analysis. This sample, a positive control sample to which T–2 toxin was added, and a negative control sample of similar vegetation were forwarded to Dr. Chester J. Mirocha of the Department of Plant Pathology, University of Minnesota. Dr. Mirocha was given no information concerning the history or content of the samples and was requested to analyze the three unknowns for the presence of trichothecene toxins using the best methods at his disposal.

The analysis involves a series of extractions followed by ferric gel separation, selected ion monitoring on a computerized gas chromatograph/mass spectrometer, and a full mass spectral scan for comparison with known standards. The methods used are among the most sensitive and specific for detection of these compounds; also, false positives are rare. Toxins can be identified by their mass spectra and quantified with a high degree of accuracy. The vegetation sample allegedly exposed to a chemical warfare agent was found to contain 109 parts per million (ppm) of nivalenol, 59.1 ppm of deoxynivalenol, and 3.15 ppm of T–2 toxin; each is a potent toxin of the trichothecene group. No trichothecenes were detected in the negative control sample, and 35 ppm of T–2 toxin were detected in the sample to which T–2 toxin had been added. It was Dr. Mirocha's assessment that a mixture of these particular toxins in the high levels detected could not have occurred as a result of natural contamination.

The possibility that the identified toxins were produced by natural fungal contamination was discounted on the basis of the climatic conditions required for production of T–2 toxin, the high levels of toxins detected, the unusual mixture of toxins found, and the results of surveys of Southeast Asia for the presence of these toxins. This conclusion was supported by the analysis of normal flora samples from Kampuchea described below.

Analyses of Control Samples From Kampuchea for the Presence of Trichothecenes. On September 20, 1981, the U.S. Army Medical Intelligence and Information Agency received nine control samples from U.S. Army personnel in Bangkok for the purpose of conducting laboratory analyses for background

TABLE D-1

Symptoms of Chemical Attacks Reported in Laos, Kampuchea, and Afghanistan

Symptom	% of Reports Mentioning Symptom	Trichothecenes	Nerve Agents	Arsines	Phosgene Oxime	Cyanogens	Incapacitant (BZ)	Riot Control Agents
Laos								
Multiple deaths	84.6	X	X	X	—	X	—	—
Vomiting	71.4	X	X	X	—	—	—	X
Diarrhea	53.1	X	X	X	—	—	—	—
Hemorrhage	52.0	X	—	—	X[a]	—	—	—
Breathing difficulty	47.95	X	X	X	X	X	X	X
Itching and skin irritation	43.9	X	—	X	X	—	—	X
Nausea	42.8	X	X	X	—	—	X	X
Animal death	41.8	X	X	X	—	X	—	—
Blurred vision	39.7	X	X	X	X	X	X	X
Headache	38.7	X	X	—	X	—	X	X
Fatigue	35.7	X	X	—	—	—	X	—
Nasal excretion	34.7	X	X	X	X	—	—	X
Rash or blisters	32.6	X	—	X	X	—	—	X
Tearing	30.6	X	X	X	X	X	—	X
Coughing	29.6	X	X	X	X	X	—	X
Effect on vegetation	26.5	X	—	X	X	—	—	—
Dizziness and vertigo	25.5	X	X	—	—	X	X	X
Facial edema	20.4	X	—	X	X	—	—	X
Thirst and dry mouth	20.4	X	—	—	—	—	X	—
Skin color change	16.3	X	—	—	X	—	—	—
Tachycardia	12.3	X	X	—	X	X	X	X
Temporary blindness	9.18	X	—	X	X	—	X	X
Rapid loss of consciousness	9.18	X[b]	X	—	—	X	X	—
Salivation	6.12	X[c]	X	—	—	—	—	—
Hearing loss	5.1	X	—	—	—	—	—	—
Tremors or convulsions	4	X	X	—	X	X	—	—
Sweating	3	—	X	—	—	—	—	—
Paralysis	3	X	X	—	—	X	—	—
Loss of appetite	3	X	X	X	—	—	—	—
Frequent urination	2	X	X	—	—	—	—	—

Continued on p. 25

Note: This table is a compilation relating the signs and symptoms reported in the three countries to symptoms associated with certain chemical agents. The frequency with which a particular symptom was reported is expressed as a percentage of the total number of attacks.

levels of trichothecene toxins. The samples were collected from an area near TV 3391 that had not been subjected to any reported chemical attacks. The samples were collected by U.S. personnel under instructions to reproduce the sampling conditions, handling, packaging, and transfer conditions of the original sample as closely as possible. The same species of plant was sampled, and four other vegetation samples also were collected. A water sample and two soil samples were recovered. Corn and rice samples from the area also were taken. These grains provided an ideal substrate for growth of toxin-producing fungi and would, therefore, be a sensitive indicator of any natural occurrence. The nine samples were forwarded under code to Dr. Mirocha for trichothecene analysis. A portion of each sample also was submitted to Chemical Systems Laboratory for background determinations of CN-, Cl-, and F-levels. No trichothecenes were detected in any of these samples, indicating that nivalenol, deoxynivalenol, T-2, and diacetoxyscirpenol are not prevalent in the geographical area from which the alleged chemical warfare-exposed sample was collected. The appearance of these trichothecenes in high levels and unique combinations in a sample associated with a chemical attack—which produced symptoms typical of trichothecene exposure—indicates that these toxins may have been used as chemical weapons. This conclusion is further supported by the evidence provided by analysis of additional alleged chemical warfare samples from Laos and Kampuchea as described below.

Analysis of Additional Chemical Warfare Samples From Laos and Kampuchea for the Presence of Trichothecenes. The U.S. Army Medical Intelligence and Information Agency received from the Chemical Systems Laboratory three additional suspected chemical warfare samples for analysis for trichothecenes. The first sample consisted of 10 ml of water taken from the same chemi-

TABLE D-1 (continued)

Symptoms of Chemical Attacks Reported in Laos, Kampuchea, and Afghanistan

Symptom	% of Reports Mentioning Symptom	Trichothecenes	Nerve Agents	Amines	Phosgene Oxime	Cyanogens	Incapacitant (BZ)	Riot-Control Agents
Kampuchea								
Multiple deaths	72.4	X	X	X	—	X	—	—
Hemorrhage	62.06	X	—	—	X[a]	—	—	—
Dizziness and vertigo	51.7	X	X	—	—	X	X	X
Vomiting	41.3	X	X	X	—	—	—	X
Nausea	34.5	X	X	X	—	—	X	X
Skin irritation	27.6	X	—	X	X	—	—	X
Rapid loss of consciousness	24.1	X[b]	X	—	—	X	X	—
Fever	20.68	X	—	—	—	—	—	—
Headache	17.2	X	X	—	X	—	X	X
Tearing	13.8	X	X	X	X	X	X	X
Breathing difficulty	13.8	X	X	X	X	X	X	X
Fatigue	13.8	X	X	—	—	—	X	—
Paralysis	10.3	X	X	—	—	X	—	—
Numbness	6.9	X	X	—	—	X	X	—
Blurred vision	6.9	X	X	X	X	X	X	X
Dry throat and thirst	6.9	X	—	—	—	—	X	—
Edema	6.9	X	—	X	X	—	—	—
Salivation	3.4	X[c]	X	—	—	—	—	—
Vegetation affected	3.4	X	—	X	—	—	—	—
Diarrhea	3.4	X	X	X	—	—	—	—
Cough	3.4	X	—	X	X	X	X	X
Nasal discharge	3.4	X	X	X	X	—	—	X
Rash or blister	3.4	X	—	X	X	—	—	X
Chills	3.4	X	?	—	—	—	—	—
Hearing loss	3.4	X	—	—	—	—	—	—
Afghanistan								
Rapid loss of consciousness	47.9	X[b]	X	—	—	X	X	—
Skin irritation and itching	31.5	X	—	X	X	—	—	X
Multiple deaths	30.1	X	X	X	—	X	—	—
Nausea	20.5	X	X	X	—	—	X	X
Vomiting	19.1	X	X	X	—	—	—	X
Tearing	17.8	X	X	X	X	X	—	X
Dizziness and vertigo	16.4	X	X	—	—	X	X	X
Blisters or rash	15	X	—	X	X	—	—	X
Difficulty breathing	13.7	X	X	X	X	X	X	X
Paralysis	13.7	X	X	—	—	X	—	—
Headache	12.3	X	X	—	X	—	X	X
Temporary blindness	8.2	X	—	X	X	—	X	X
Salivation	6.8	X[c]	X	—	—	—	—	—
Loss of appetite	6.8	X	X	X	—	—	—	—
Effects on vegetation	5.5	X	—	—	—	—	—	—
Fatigue	5	X	X	—	—	—	X	—
Confusion	4.1	X	X	—	—	—	X	—
Hemorrhage	4.1	X	—	—	X[a]	—	—	—
Change in skin color	2.8	X	—	—	X	—	—	—
Diarrhea	2.8	X	X	X	—	—	—	—
Coughing	1.3	X	X	X	X	X	X	X

[a] Bloody frothing.
[b] Only at very high doses.
[c] Depending on which trichothecenes.
[d] Blood flecked frothing.

18-467 O - 83 - 3

cal attack site in Kampuchea as the leaf and stem sample previously examined. The second sample came from the site of a "yellow rain" attack occurring on March 13, 1981, in the village of Muong Cha (TF 9797) in the Phou Bia region of Laos. The agent was sprayed from a twin-engine propellor aircraft at about noon, local time. The falling substance was described as "like insect spray" and sounded like drizzling rain. Quite sticky at first, it soon dried to a powder. Symptoms described by victims included nausea, vomiting, and diarrhea. A sample of the agent scraped from the surface of a rock by a victim and carried into Thailand was turned over to U.S. Embassy personnel. The third sample was taken from the site of a "yellow rain" attack that occurred at 2:00 p.m. on April 2, 1981, at Ban Thong Hak (TF 9177). Twenty-four people reportedly died in this attack; there were 47 survivors. Symptoms included severe skin irritation and rash, nausea, vomiting, and bloody diarrhea. A survivor of the attack scraped this sample from the surface of a rock with a bamboo knife. Although the individual took precautions (that is, cloth mask), a severe skin rash and blisters developed.

These three samples were submitted to Dr. Mirocha for analysis. The water sample from Kampuchea contained 66 ppm of deoxynivalenol and a trace amount of diacetoxyscirpenol. A trace quantity of the second sample was screened as strong positive for trichothecenes. Further analysis of that sample confirmed the presence of high levels of T-2 toxin (150 ppm) and diacetoxyscirpenol (25 ppm). Nivalenol and deoxynivalenol may also be present but are being masked by interference from phtalate compounds (leached from the plastic packaging). An effort to modify the extraction process is being made in order to overcome the interference so that nivalenol and deoxynivalenol can be measured more easily. Interestingly, examination of the petroleum ether fraction from the sample revealed the presence of a yellow pigment almost identical to that previously identified by Dr. Mirocha in cultures of *Fusarium roseum*, indicating that the yellow powder probably consisted of the crude extract of a *Fusarium* culture.

There was little of the third sample contained in the vial received for testing. The quantity was too small to be weighed accurately, and inspection of the vial revealed only a small speck estimated to weigh much less than 0.1 mg. That speck contained 10 ng of diacetoxyscirpenol, a level equivalent to 100 ppm at the very least and probably much higher. The sample size was too small to allow adequate analysis for the other three trichothecenes of interest.

These results support the hypothesis that trichothecenes have been used as chemical warfare agents in Laos and Kampuchea. The presence of these high levels of trichothecene toxins in water and in yellow powder scraped from rocks argues against natural occurrence, since neither water nor rock is a suitable environment for growth of the fungi required to produce the toxins.

Differences between the analyses of the Kampuchean leaf and stem sample and the water sample collected from the same attack site raise additional questions. Failure to find T-2 toxin in the water sample is probably due to the relative insolubility of T-2 toxin in water. The presence of diacetoxyscirpenol in the water might be the result of biotransformation or breakdown of T-2, as they are so structurally similar, differing only in the substitution on carbon 8. While this hypothesis cannot be entirely ruled out, it is unlikely on the basis of known biotransformation of T-2 in the laboratory. The initial vegetation sample was not screened for diacetoxyscirpenol, although the mass spectra from the initial analysis will be reexamined for trace amounts of it.

The absence of nivalenol in the water sample is more difficult to explain because nivalenol is water soluble. The effect of environmental conditions and microorganisms on the stability of these compounds may vary widely for each of the specific compounds and may explain the analytical results. Further scientific investigation of these factors is needed.

Analysis of Blood Samples From Chemical Attack Victims

Blood samples drawn from victims of recent chemical attacks in Kampuchea have been received by the U.S. Army Medical Intelligence and Information Agency for analysis for indications of trichothecene exposure. Little is known concerning the rate of metabolism of trichothecenes in humans; it is difficult, therefore, to estimate the probability of detecting trichothecenes or their metabolites in blood samples. T-2 is rapidly cleared from the blood in animals, and 25% of the total dose is excreted within 24 hours after exposure; it is unlikely that trichothecenes could be detected unless blood samples were obtained within 24–48 hours after an attack. Other blood parameters are affected by the trichothecenes, however, and may prove to be useful markers. The trichothecenes induce a severe leukopenia (decrease in white cell count) which can persist for several weeks following exposure. In addition, the trichothecenes affect some liver and kidney function marker enzymes which can be monitored in the blood.

On October 11, 1981, four whole blood samples and four blood smears were received from the U.S. Embassy in Bangkok. The blood was drawn from four Khmer Rouge soldiers on October 7, 1981 at a Khmer Rouge hospital inside Kampuchea. Detailed medical histories as well as descriptions of the attack were recorded on each individual from whom a blood sample was taken. All four men were victims of a gas attack occurring near Takong on September 19, 1981. Symptoms experienced included vomiting, blurred vision, bloody diarrhea, difficult breathing, dry throat, loss of consciousness, frontal headache, tachycardia, and facial edema. Unfortunately, the samples could not be refrigerated until 48 hours after collection. Thus, it was impossible to obtain data concerning white cell counts and blood chemistry. The four whole blood samples were submitted to Dr. Mirocha for analysis for trichothecene metabolites because of the possibility, admittedly remote, that some of the metabolites might bind to blood proteins and might still be detectable even 3 weeks after an attack.

On October 22, 1981, additional blood samples were received. These had been drawn from nine victims from the September 19 attack and from four control individuals of similar age and background who had not been exposed to a chemical attack. The samples had been properly refrigerated and were accompanied by complete and detailed medical histories taken by trained medical personnel who examined the individuals. Included in the package were blood smears and heparinized and nonheparinized samples from each individual. The samples were submitted for blood assays to the U.S. Army Medical Research Institute of Infectious Diseases.

The above results show no statistically significant differences between exposed and control groups (students T-test). In eight individuals exposed to a chemical agent, a trend toward depressed white cell counts was observed. Such an observation would be compatible with the clinical picture of toxin exposure; however, it is also compatible with a number of other medical problems, and a larger control sample would

be required before such results could be adequately interpreted. Abnormal liver and kidney functions were not indicated by these data.

Portions of the blood samples were analyzed by Dr. Mirocha for the presence of trichothecenes and/or trichothecene metabolites. The results of the analyses are consistent with trichothecene exposure in at least two of the gassing victims and tend to support the hypothesis that a trichothecene-based agent was used in this attack.

Using the selected ion-monitoring gas chromatography/mass spectroscopy analysis technique, Dr. Mirocha was able to identify tentatively a metabolite of T-2 toxin (that is, HT-2) in the blood of two alleged victims. The compound was identified on the basis of its selected ion masses and gas chromatographic retention times.

The tentative identification of HT-2 in the blood of two victims, and the trend toward depressed white cell counts in these same victims, cannot be taken as conclusive scientific proof of toxin exposure because the trace amount of the compound present precluded unequivocal identification and quantification and because many other medical problems in addition to toxin exposure can cause a decrease in white cell counts. It is interesting to note that the individual who showed the greatest amount of the compound tentatively identified as HT-2 in his blood reportedly received the greatest exposure to the agent. He was exposed to contaminated water for more than 30 minutes and was the only victim who fell down in the water and actually swallowed some of it. However, the description by victims of symptoms correlating exactly with those associated with trichothecene poisoning provides strong circumstantial evidence that trichothecenes were used as chemical agents in yet another chemical attack in Southeast Asia.

Trichothecenes have been identified previously in environmental samples taken from several other chemical attacks in Laos and Kampuchea. Analysis of control vegetation, water, soil, corn, and rice samples from these areas, as well as reviews of published scientific literature, indicates that the particular toxins that have previously been identified are not known to occur naturally in the combinations found and at the levels detected in Southeast Asia. The latest analysis results contribute another piece of evidence to the growing body of data supporting the charge that trichothecenes have been used as chemical/biological agents in Southeast Asia.

ANNEX E

Overview of Natural Occurrence and Significant Properties of Trichothecenes

Historical Trichothecene Mycotoxicoses

The trichothecenes are members of a large group of naturally occurring toxins known as mycotoxins. The word "mycotoxin" is derived from the Greek "mykes" meaning fungus and the Latin "toxicum" meaning poison. It refers to a metabolite produced by a mold that is toxic to man and animals. Mycotoxicoses have been described as the "neglected diseases," and before 1960 English-language literature concerning the diseases caused by mycotoxins was scarce. Soviet scientists have been involved in research with some of these compounds for almost 30 years longer than their Western counterparts. The Soviet Union has had serious problems with mycotoxin contamination of food and has suffered several severe outbreaks of disease in humans. The first comprehensive studies of mycotoxin diseases were conducted in the Soviet Union in the late 1930s.

Since the 1940s, the group of mycotoxins figuring most prominently in Soviet scientific literature are the trichothecenes, a class of chemically related, biologically active fungal metabolites produced primarily by various species of *Fusarium*. Table E-1 lists some of the toxins in this group and producing fungi. The fungi are well-known plant pathogens that frequently invade many agricultural products.

Trichothecene toxins, perhaps more than any other mycotoxins, have been associated with acute disease in humans. Most of the human intoxications have occurred in the Soviet Union (Table E-2). The earliest recognized outbreak occurred in 1891 in the Ussuri district of eastern Siberia. Humans who consumed contaminated grain exhibited headache, chills, nausea, vomiting, vertigo, and visual disturbances. Dogs, horses, pigs, and domestic fowls reportedly were affected.

The most extensive mycotoxicosis outbreak reported to have caused multiple fatalities in man also occurred in the Soviet Union. In 1944, 30% of the population of Orenburg district, near Siberia, was affected by alimentary toxic aleukia (ATA), a disease later shown to be caused by ingestion of trichothecene toxins. More than 10% of the entire population of the district died of the disease. Many other outbreaks of ATA occurred in the Soviet Union, mainly during the 1942–47 period. The contamination was traced to overwintered millet, wheat, and barley infected with *Fusarium*. Symptoms of the disease included vomiting, skin inflammation, multiple hemorrhaging (especially of the lung and gastrointestinal tissue), diarrhea, leukopenia, and suppression of bone marrow activity.

In 1939, Premier Joseph Stalin dispatched Nikita Khrushchev to the Ukraine to organize and improve agricultural operations and to identify the disease causing the deaths of many horses and cattle. The problem was traced to hay and straw contaminated with *Stachybotrys atra*. The disease, later referred to as stachybotryotoxicosis, occurred after ingestion or contact with the contaminated grain. Symptoms included ulcerative dermatitis, peroral dermatitis, blood dyscrasias, hemorrhagic syndromes, abortion, and death. The greatest economic impact was due to loss of horses, although cattle, sheep, poultry, and humans also were affected.

Other disease outbreaks in which similar symptoms were present occurred in 1958 and 1959 among horses and cattle in the Soviet Union and Eastern Europe; thousands of animals were lost. Other intoxications were reported later

---

Soviet Scientists Involved in Mycotoxin Research

A. Kh. Sarkisov—All Union Scientific Research Institute of Experimental Veterinary Science, Moscow
V. I. Bilay (also spelled Bilai)—Ukrainian S.S.R. Institute of Microbiology and Virology, Kiev
V. A. Tutel'yan—U.S.S.R. Academy of Medical Sciences Nutrition Institute, Moscow
M. A. Akhmeteli—U.S.S.R. Academy of Medical Sciences Institute of Epidemiology and Microbiology

L. Ye. Olifson
M. F. Nesterin
K. Z. Salomatina
Ye. P. Kozhevnikova
N. D. Osadchaya
L. F. Mikhaylova
Sh. M. Kenina
V. L. Kartashova
L. R. Filonova
T. Ye. Tolcheyeva
Kn. A. Dzhilavyan
I. S. Yelistratov
N. S. Tishkova
V. I. Kaplun
Ye. P. Kozhevalkova
S. M. Gubkin
L. I. Il'ina
P. A. Il'in
A. M. Kogan
D. T. Martynenko
N. A. Kostyunina
V. V. Yerinakov
I. A. Kurmanov
V. V. Semenov
Z. K. Bystryakova
Z. Z. Orlova
L. S. L'vova
L. I. Lozbina
T. A. Shevtsova
I. Yu. Makedon
N. S. Proskuryakova
A. V. Borovkov
M. N. Nazypov
L. I. Lozbin
M. S. Marova

---

in Japan, Europe, the Soviet Union, and the United States, affecting various domestic animals and—in the case of "red mold toxicosis"—man. All of these diseases have now been shown to be due to ingestion of trichothecenes rather than to an infectious agent. In earlier outbreaks, the levels of toxin present in the contaminated grain were not measured; however, the levels of nivalenol and/or deoxynivalenol measured in toxic grains implicated in more recent outbreaks (i.e., "moldy corn toxicosis" and "red mold toxicosis") typically were between 2 and 8 ppm.

TABLE E-1
Trichothecene-Producing Fungi

Type	T-2 Type	Nivalenol-Type	Macrocyclic
Trichothecenes	T-2 Toxin	Nivalenol	Roridins
	HT-2 Toxin	Moncacetyl-Nivalenol	Verrucarins
	Diacetoxyscirpenol	Diacetyl-Nivalenol	Satratoxins
	Neosolaniol	Deoxynivalenol	Vertisporin
Fungus	F. tricinctum	F. nivale	Myrothecium verrucaria
	F. roseum	F. opisphaeria	
			M. roridum
	F. equiseti	F. roseum	
	F. sporotrichioides		Stachybotrys atra
			Verticimonosporium diffractum
	F. lateritium		
	F. poae		
	F. solani		
	F. rigidiusculum		
	F. semitectum		

TABLE E-2
Historical Trichothecene Mycotoxicoses

Toxicosis	Districts and Affected Species	Symptoms
"Taumetgatrede" Toxicosis	U.S.S.R.: man, farm animals	Headache, nausea, vomiting, vertigo, chills, visual disturbances
Alimentary toxic aleukia	U.S.S.R.: man, horse, pig	Vomiting, diarrhea, multiple hemorrhage, skin inflammation, leukopenia, angina
Stachyborrytotoxicosis	U.S.S.R., Europe: horse	Shock, stomatitis, hemorrhage, dermal necrosis, nervous disorders
Bean-hull toxicosis	Japan: horse	Convulsion, cyclic movement
Dendrodochiotoxicosis	U.S.S.R., Europe: horse	Skin inflammation, hemorrhage
Moldy corn toxicosis	United States: pig, cow	Emesis, hemorrhage
Red mold toxicosis	Japan, U.S.S.R.: man, horse, pig, cow	Vomiting, diarrhea, congestion and hemorrhage of lung and intestine

Natural Occurrence of Trichothecene Mycotoxins

Publications concerning the occurrence of trichothecenes are relatively scarce because of the lack of convenient detection methods and the complexity of the trichothecene family of compounds. Only recently have scientists developed methods capable of distinguishing between close structural derivatives and accurately quantifying the levels of toxin present (see Table E-3 for comparison of analytical methods). Extreme care must be taken when reviewing the scientific literature on natural occurrence of these compounds because erroneous conclusions can be drawn on the basis of results obtained with inadequate analytical techniques. Misidentification of compounds and gross overestimation of concentrations have occurred using techniques such as thin layer chromatography.

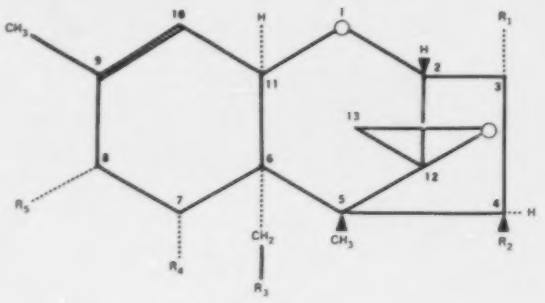
Table E-4 lists the reports of natural occurrence of T-2 toxin, diacetoxyscirpenol, and nivalenol that were obtained from a literature search of more than 3,000 citations concerned with trichothecene toxins. Levels that are questionable on the basis of techniques used are indicated. It is immediately apparent that the levels of toxins found in the various samples from Laos and Kampuchea are highly unusual, even if one accepts the questionable reports in Table E-4 as valid. The levels of these toxins (150 ppm of T-2 toxin, 109 ppm of nivalenol, more than 100 ppm of diacetoxyscirpenol, and 66 ppm of deoxynivalenol) are markedly higher than those reported to occur in nature. It should also be noted that the incidences recorded in Table E-4 concern levels of toxin produced when *Fusarium* is growing on its ideal substrate, while the Laos and Kampuchea samples were taken from surfaces—rocks and water—that would be extremely unlikely to support *Fusaria* growth and toxin production. Higher levels of toxin production can, of course, be induced when the mold species is grown in pure culture under ideal laboratory conditions; for instance, the Soviets have succeeded in producing 4 grams of T-2 per kilogram of substrate. In a natural environment, however, the *Fusaria* species cannot compete well with other molds such as species of *Aspergillus* and *Penicillium*, and levels of toxin produced are orders of magnitude lower.

The conclusion that the levels of toxins found in the Southeast Asia samples could have occurred only by means of an unnatural mechanism is also strengthened by surveys of the area conducted

by various researchers. Surveys of the toxigenic fungi and mycotoxins naturally present in Southeast Asia conducted by the Mahidol University in Bangkok and the Massachusetts Institute of Technology have not revealed the presence of T-2, nivalenol, deoxynivalenol, or diacetoxyscirpenol, although other mycotoxins such as aflatoxin were identified. These results were confirmed by our analysis, using our own methodology, of normal flora samples of vegetation, soil, water, corn, and rice from Kampuchea that failed to reveal the presence of trichothecenes.

Skeptics have formulated theoretical explanations for the analytical results to support a hypothesis of natural occurrence of these toxins. It was postulated that the trichothecenes found were absorbed through the roots of a plant, translocated to the leaves, and exuded and washed onto the surface of a rock and into water where they were found. A 1981 publication by Jarvis et al. reported a Brazilian shrub that appeared to absorb, translocate, and chemically alter a macrocyclic trichothecene produced by soil fungi. While this citation is used to support a hypothetical mode for natural deposition in Southeast Asia, it should be noted that the plant reported in this publication did not exude the toxin, that the toxin was extremely phytotoxic to all other plants assessed, and that the plant was not capable of de novo trichothecene synthesis. No other trichothecenes have been found to be absorbed and translocated in any other plant in this manner. Control samples of soil and vegetation from Southeast Asia do not support endemic presence of these toxins. The appearance of these particular trichothecene toxins in these high levels in environments generally inhospitable to their formation cannot reasonably be attributed to a natural contamination.

FIGURE E-1
General Structure of Trichothecenes



T_2 Toxin	Nivalenol	Deoxynivalenol
R_1=OH	R_1=OH	R_1=OH
R_2=OAc	R_2=OH	R_2=H
R_3=OAc	R_3=OH	R_3=OH
R_4=H	R_4=OH	R_4=OH
R_5=$OCOCH_2CH(CH_3)_2$	R_5= =O	R_5= =O

Chemical and Physical Properties of the Trichothecenes

When considering the suitability of trichothecenes as agents, factors such as stability, solubility, and ease of production must be considered. The general structure for the trichothecene group is shown in Figure E-1. There are more than 40 currently known, naturally occurring, 12 to 13 epoxytrichothecenes. The R groups may be hydroxyls, acylated hydroxyl groups or esters. The R group for the toxins detected in the sample is shown below the general structure. All of the compounds have in common an olefinic double bond at carbon atoms 9 and 10 and an epoxy group at carbon atoms 12 and 13. These compounds are stable, especially in the solid form. They may be stored for years at room temperature with no loss of activity. They are heat stable with no loss of activity noted after heating for 1 hour at 100° centigrade. The solubility depends on the R groups; highly hydroxylated derivatives are more water soluble. The compounds are also quite stable in solution. Detoxification can be accomplished by treatment with strong mineral acid, which will open the 12 to 13 epoxide bond and abolish all biological activity. Most of the toxins are well absorbed through mucous membranes and some through skin; this property is also a function of the R group.

Some of these compounds have been synthesized chemically; however, biosynthesis employing *Fusarium* species is the most effective way to produce large quantities. In a preliminary search of recent Soviet literature, 50 articles dealing

TABLE E-3

Physicochemical Methods for Detection of Trichothecenes in Feedstuffs

Method	Trichothecenes Detected	Detection Limits	Required Standards	Use and Limitation
Thin-layer chromatography 1-dimension	All	0.1 microgram/spot (H_2SO_4)	Reference Standard	Qualitative Interference Not confirmatory
Thin-layer chromatography 2-dimension	All	0.1–1.0 microgram/ spot (H_2SO_4)	Reference Standard	Qualitative Less interference Confirmatory
Gas-liquid chromatography	Nonhydroxy-lated or TMS derivatives	0.03–0.05 microgram/ microliter injection	Reference Standard	Quantitative Monoglyceride interference Equivocable identification
Gas chromato-graphy/mass spectrometry-normal scanning mode	TMS derivatives	0.02–0.05 microgram/ microliter injection	Reference Standard or Spectrogram	Semiquantitative Less interference Unequivocable identification
Gas chromato-graphy/mass spectrometry-selection ion monitoring	TMS derivatives	0.007–0.02 microgram/ microliter injection	Reference Standard or Spectrogram	Quantitative Best for complex mixtures Unequivocable identification
Nuclear-magnetic-resonance	All	——	Reference Standard or Spectrogram	Confirmatory Purified toxin structure elucidation
Radio-immunoassay (developmental stage)	T-2 toxin	1–20 nanogram	Rabbit anti-T-2 toxin anti-body	Sensitive Low interference
			HT-2 toxin	Relative structural specificity

with the trichothecenes were reviewed. Of these, 22 dealt with defining optimum conditions for biosynthesis of the compounds. N.A. Kostyunina has reported production of T-2 toxin at levels of 4 grams per kilogram of substrate (normally wheat grain or rice). Many industrial microbiology plants have been identified in the Soviet Union. Some are involved in production of single-cell protein for fodder additives, others produce antibiotics, and the function of still others is unknown. *Fusaria* are produced in the Soviet Union at a facility long reported in the open literature as being a suspected biological warfare agent production and storage facility. This facility, Berdsk Chemical Works, is near the [illegible] city of Novosibirsk in Siberia. The only difference between an antibiotic and mycotoxin is their target specificity. Both are produced by fungi, but the mycotoxins are relatively more toxic to man than to microorganisms. Mycotoxins can be produced in good yield employing the same techniques used to produce some antibiotics. Thus, it may be concluded that the Soviets could produce trichothecenes in large amounts. They produce an antibiotic that is a trichothecene derivative, which would provide an ideal cover for agent production facilities.

Medical Effects of the Trichothecenes in Humans

The most prominent symptoms associated with trichothecene poisoning are listed in Table E-2. Striking among these is the rapid onset of vomiting, along with severe itching and tingling of the skin. Hemorrhage of the mucous membranes and bloody diarrhea follow. The symptoms shown in Table E-2 are similar to those reported by victims of trichothecene attacks in Laos, Kampuchea, and Afghanistan. The correlation is striking.

The LD_{50}'s (dose required to produce death in 50% of a test population) of the trichothecenes in laboratory animals range from 0.1 mg/kg to greater than 1,000 mg/kg, depending on the particular toxin, species, and route of exposure. The LD_{50} of T-2 toxin in a cat is 0.5 mg/kg. However, the ED_{50} (dose required to produce a desired physiological effect in 50% of a test population) is much lower. The ED_{50} to produce a vomiting reaction is 0.1 mg/kg; for skin irritation it is in the tenths of microgram range.

Most of the data concerning the toxicological effects of the trichothecenes are derived from animal data in which pure compounds were administered by oral, subcutaneous, intraperitoneal, or intravenous routes. Unfortunately, there are no reports concerning the effects of inhalation of mixtures of the compounds. Therefore, it is difficult to speculate concerning the effects that would be expected in humans exposed to an aerosol of mixtures of these potent toxins. The most useful data concerning exposure in humans were obtained in a phase I clinical evaluation of anguidine (diacetoxyscirpenol) as an anticancer drug. Diacetoxyscirpenol was administered by intravenous infusion. Doses of 3 mg/m²/day caused immediate onset of nausea, vomiting, diarrhea, somnolence and/or mental confusion, fever, chills, a generalized erythema with a burning sensation, hypotension, dyspnea, stomatitis, hives, and ataxia. Because of the side effects, the treatment was discontinued. The properties which make the use of diacetoxyscirpenol potentially useful as an anticancer drug are the same as those responsible, in part, for its extreme toxicity. It and the other trichothecenes cause extensive damage to rapidly dividing cells such as tumor cells. Unfortunately, the cells of the lining of the gastrointestinal tract and bone marrow are also rapidly dividing, and the effects of the trichothecenes on these cells result in severe, rapid degeneration of these tissues. The compounds also have direct effects on the clotting factors in the blood (that is, a primary effect on Factor VII activity and a secondary effect on prothrombin), which result in excessive hemorrhage following trauma.

The other useful body of clinical data concerning the effects of trichothecenes in humans is drawn from descriptions of the course of the disease in the natural

TABLE E-4
Spontaneous Occurrence of Trichothecene Mycotoxins

Toxin	Country	Source	Concentration (parts per million)	Reference[a]
T-2 Toxin	U.S.	Mixed feed	0.08[b]	15
	U.K.	Brewer's grains	ND[c]	19
	India	Sweet corn	4[b, d]	5
	Canada	Corn	ND	4
	India	Sorghum	ND[d]	22
	Canada	Barley	25[d]	20
	India	Safflower seed	3–5[d]	6
	U.S.	Corn stalks	0.11[b]	16
	U.S.	Feed supplement	ND	7
	U.S.	Corn	2	8
	U.S.	Mixed feed	0.3	14
	France	Corn	0.02[b]	10
	U.S.	Corn	ND	2
Diacetoxy-scirpenol	U.S.	Mixed feed	0.5	15
	U.S.	Mixed feed	0.38	15
	India	Safflower seed	3–5[d]	6
	India	Sweet corn	14[d]	5
	Germany	Corn	31.5[d]	23
	U.S.	Corn	0.88	21
Deoxynivalenol	U.S.	Corn stalks	1.5[b]	16
	U.S.	Corn	1.8[b]	15
	U.S.	Corn	1.0[b]	15
	U.S.	Corn	0.1[b]	15
	U.S.	Mixed feed	0.04[b]	15
	U.S.	Mixed feed	1.0[b]	15
	U.S.	Mixed feed	1.0[b]	15
	U.S.	Corn	7.4	9
	U.S.	Corn	0.1–25[d]	21
	U.S.	Corn	trace–25[d]	2, 21
	U.S.	Corn	1.1–10.7	26
	U.S.	Corn	41	25
	U.S.	Corn	1.0[b]	17
	U.S.	Oats	5	17
	Japan	Barley	ND	18
	U.S.	Corn	1.0[b]	13
	U.S.	Corn	0.06[b]	13
	U.S.	Mixed feed	0.07[b]	13
	France	Corn	0.6[b]	10
	South Africa	Corn	2.5	11
	Zambia	Corn	7.4	11
	U.S.	Corn	ND	2
	Japan	Barley	7.3	18
	Austria	Corn	1.3	24
	Austria	Corn	7.9	24
	Canada	Corn	7.9	24
Nivalenol	Japan	Barley	ND	18
	France	Corn	4.3[b]	10
Partially characterized trichothecenes	U.S.	Corn	ND	25
	India	Safflower seed	ND[d]	6
Skin irritant factors—not analyzed chemically	U.S.	Corn	93 positive[e] of 173	3
	U.S.	Corn	Multiple positive samples	21
	Yugoslavia	Corn	16 positive of 191	1

FOOTNOTES

[a] References
1. Balzer *et al.* (1977)
2. Ciegler (1978)
3. Eppley *et al.* (1974)
4. Funnel (1979)
5. Ghosal *et al.* (1976)
6. Ghosal *et al.* (1977)
7. Hubbs *et al.* (1974)
8. Hsu *et al.* (1972)
9. Isshi *et al.* (1975)
10. Jemmali *et al.* (1978)
11. Marasas *et al.* (1977)
12. Miller (1976)
13. Mirocha (1979)
14. Mirocha (1979)
15. Mirocha *et al.* (1976)
16. Mirocha *et al.* (1979)
17. Mirocha *et al.* (1979)
18. Morooka *et al.* (1972)
19. Petrie *et al.* (1977)
20. Puls and Greenway *et al.* (1976)
21. Romer, T., Ralston Purina, St. Louis, MO (personal communication)
22. Rukmini and Bhat (1978)
23. Siegfried (1979)
24. Vesonder and Ciegler (1979)
25. Vesonder *et al.* (1976)
26. Vesonder *et al.* (1978)

[b] Zearalenone (F-2 toxins) also detected in the sample.

[c] ND = toxin concentration was not determined.

[d] Levels that are questionable on the basis of techniques used.

outbreaks that occurred in the Soviet Union. The effects produced are similar to radiation poisoning, and there is a latent phase similar to that seen in radiation poisoning, in which the overt symptoms disappear.

The clinical picture may be divided into four stages.

The first stage occurs within minutes to hours after ingestion of toxic grains. The symptomatology described was produced by oral exposure to low doses. In exposure by inhalation, the symptoms may be more pronounced or the time course accelerated. The characteristics of the first stage include primary changes, with local symptoms, in the buccal cavity and gastrointestinal tract. Shortly after ingestion of toxic grain, the patient experiences a burning sensation in the mouth, tongue, throat, palate, esophagus, and stomach as a result of the toxin's effect on the mucous membranes. The tongue may feel swollen and stiff, and the mucosa of the oral cavity may be hyperemic. Inflammation of the gastric and intestinal mucosa occurs, along with vomiting, diarrhea, and abdominal pain. In most cases excessive salivation, headache, dizziness, weakness, fatigue, and tachycardia accompany the initial stage. There may be fever and sweating, but the body temperature normally does not rise. The leukocyte count may begin to decrease in this stage, and there may be an increased erythrocyte sedimentation rate. This first stage may last from 3 to 9 days.

The second stage is often called the latent stage or incubation period because the patient feels well and is capable of normal activity. It is also called the leukopenic stage because its main features are disturbances in the bone marrow and the hematopoietic system, characterized by a progressive leukopenia and granulopenia and a relative lymphocytosis. In addition, anemia and a decrease in erythrocytes, in the platelet count, and in hemoglobin occur. Disturbances in the central nervous system and autonomic nervous systems may occur as well as weakness, vertigo, fatigue, headache, palpitations, and mild asthmatic conditions. Visible hemorrhagic spots (petechiae) begin to appear on the skin, marking the transition to the third phase. The second stage may last 3–4 weeks. The transition to the third stage is sudden, and symptoms progress rapidly.

In the third stage, petechial hemorrhages occur on the skin of the trunk, arms, thighs, face, and head. They can vary from a millimeter to a few centimeters in size. Capillaries are fragile, and any slight trauma results in hemorrhage. Hemorrhages of the mucous membranes of the mouth, tongue, soft palate, and tonsils occur. Nasal, gastric, and intestinal hemorrhages can be severe. Areas of necrosis begin to appear on the lips, fingers, nose, jaws, eyes, and in the mouth. Lymph nodes are frequently enlarged, and the adjoining connective tissue can become so edematous that the patient has difficulty opening his mouth. Blood abnormalities previously described are intensified. Death may occur from hemorrhage, strangulation due to swelling, or secondary infection.

The fourth stage is convalescence. Three or 4 weeks of treatment are required for disappearance of necrotic lesions and hemorrhagic effects. Two months or more may elapse before the bloodforming capability of the bone marrow returns to normal. ■

Published by the United States Department of State • Bureau of Public Affairs • Office of Public Communication • Editorial Division • Washington, D.C. • March 1982
Editors: Norman Howard and Colleen Sussman • This material is in the public domain and may be reproduced without permission; citation of this source is appreciated.

Bureau of Public Affairs
United States Department of State
Washington, D.C. 20520

Official Business

If address is incorrect please indicate change. Do not cover or destroy this address label ►

Postage and Fees Paid
Department of State
STA-501

Special
Report No. 104

United States Department of State

Chemical Warfare in Southeast Asia and Afghanistan: An Update

---

Report from
Secretary of State
George P. Shultz

November 1982

THE SECRETARY OF STATE
WASHINGTON

TO THE CONGRESS OF THE UNITED STATES
AND MEMBER STATES OF THE UNITED NATIONS:

Chemical and toxin weapons are of special concern to mankind. Used against civilian populations, or even against soldiers with protective equipment, they can cause protracted and indiscriminate physical and psychological suffering and, as we witnessed in World War I, widespread death as well. For such reasons, the international community has outlawed the use of these weapons. The 1925 Geneva Protocol, one of the oldest arms control agreements still in force, forbids the use of chemical and biological weapons in war. The 1972 Biological and Toxin Weapons Convention prohibits the mere possession of toxin weapons. In an effort to extend such legal constraints still further, the United States—together with other countries in the Committee on Disarmament at Geneva—is seeking an outright ban on the development, production and stockpiling of chemical weapons.

I regret, then, to report that chemical and toxin weapons are nevertheless being used today in Laos, Kampuchea and Afghanistan by the Soviet Union and its allies. In March of this year, we reported on this subject to the Congress, the United Nations, and to the members of the international community. Our report, which contained a comprehensive and detailed compilation of the evidence available to the United States Government, was designed to bring the issue to the attention of the world community. In presenting it, we invited others to join us in examining the evidence and in confirming the truth.

These efforts have not led the Soviets and their allies to halt their illegal use of chemical and toxin weapons. Instead, they continue to deny the truth about their illegal activities. The world cannot be silent in the face of such human suffering and such cynical disregard for international law and agreements. The use of chemical and toxin weapons must be stopped. Respect for existing agreements must be restored and the agreements themselves strengthened. Respect for the dignity of humanity must be restored. Failure to achieve these goals can only have serious implications for the security of the world community, particularly for the security of smaller nations, like those whose people are being attacked. If such basic elements of human rights can be so fundamentally ignored, how can we believe any pledges to respect human rights?

All who would seek to promote human rights, and all who would seek to maintain the credibility of international agreements, have a duty to call world attention to the continuing use of chemical and toxin weapons, and to seek a halt to their use. It is for this purpose that the United States provides the following report.

Sincerely,

George P. Shultz

George P. Shultz

CONTENTS

	Page
Updated Findings	3
Introduction	3
Summary of Evidence	4
Afghanistan	4
Laos	5
Kampuchea	7

TABLES

Table 1: Afghanistan: Reported Attacks, 1982 4

Table 2: Laos: Reported Attacks, 1982 6

Table 3: Kampuchea and Thailand: Reported Attacks, 1982 7

ANNEXES

Annex A: Analysis of Samples for Chemical Warfare Agents and Toxins 8

Annex B: Autopsy Results of a Chemical Warfare Attack Victim in Kampuchea 10

Annex C: Discussion of Analytical Findings 11

This report presents conclusions based on further evidence about chemical and toxin warfare activities in Laos, Kampuchea, and Afghanistan that has become available to the U.S. Government since publication of the special report on this subject on March 22, 1982. The evidence includes new information on events occurring since the first of this year as well as additional information from a variety of sources on activities described in that report. The current report is accompanied by tables listing recent and newly reported attacks and annexes providing additional sample analysis results, medical evidence, and other supporting data.

UPDATED FINDINGS

Based on a thorough analysis of this new information, we are able to conclude the following:

- Reports of chemical attacks from February through October 1982 indicate that Soviet forces continue their selective use of chemicals and toxins against the resistance in Afghanistan. Moreover, new evidence collected in 1982 on Soviet and Afghan Government forces' use of chemical weapons from 1979 through 1981 reinforces the previous judgment that lethal chemical agents were used on the Afghan resistance. Physical samples from Afghanistan also provide new evidence of mycotoxin use.
- Vietnamese and Lao troops, under direct Soviet supervision, have continued to use lethal and incapacitating chemical agents and toxins against the H'Mong resistance in Laos through at least June 1982.
- Vietnamese forces have continued to use lethal and incapacitating chemical agents and toxins against resistance forces in Kampuchea through at least June 1982.
- Trichothecene toxins were found in the urine, blood, and tissue of victims of "yellow rain" attacks in Laos and Kampuchea and in samples of residue collected after attacks.
- We continue to find that a common factor in the evidence is Soviet involvement in the use of these weapons in all three countries. Continued analysis of prior data and newly acquired information about Soviet mycotoxin research and development, chemical warfare training in Vietnam, the presence of Soviet chemical warfare advisers in Laos and Vietnam, and the presence of the same unusual trichothecene toxins in samples collected from all three countries reinforce our earlier conclusion about the complicity of the Soviet Union and about its extent.

INTRODUCTION

Our March study showed that casualties and deaths resulted from chemical attacks in Southeast Asia and Afghanistan and that trichothecene toxins were used in both Laos and Kampuchea. The new evidence shows that these attacks are continuing in all three countries and that trichothecene toxins have been used in Afghanistan as well.

The same rigorous analytical processes employed in our March study, and outlined in detail there, were followed to arrive at the judgments contained in this update. In light of the widespread publicity given the March report, special efforts were made by U.S. Government analysts to preclude being led astray by any possible false reports that might be generated for propaganda or other purposes and to eliminate the possibility of making erroneous judgments about the chemical or toxin agents involved because of tampering or improper handling. Every report has been carefully checked.

The evidence in the March study was based on a broad range of data, including testimony by physicians, refugee workers, journalists, and others. Although some of the new reports are anecdotal, we have been able to corroborate most of them by other sources and sample analysis. Moreover, personal testimony tends to add credence to other accounts which, taken together, form a coherent picture. The material presented in this report represents only a relatively small amount of the total accumulated evidence. This additional information is examined in greater detail in the annexes. Improved sample collection procedures, a better quality of medical histories and physical examinations, documentation including photographs of lesions and hospital charts from Southeast Asia, and interviews by trained personnel have reinforced our earlier conclusions and led to new discoveries.

As international concern about this subject has increased, based on the

development of evidence from many countries, independent analyses have been initiated by foreign chemical warfare experts, physicians, journalists, and independent nongovernmental scientists and laboratories. Analysts in the United States have found this research very helpful both in supporting their own conclusions and, more importantly, in expanding on them.

SUMMARY OF EVIDENCE

Afghanistan

Evidence indicates that the Soviets have continued the selective use of toxic agents in Afghanistan as late as October 1982. For the first time we have obtained convincing evidence of the use of mycotoxins by Soviet forces through analyses of two contaminated Soviet gas masks acquired from Afghanistan. Analysis and quantification of material taken from the outside surface of one mask have shown the presence of trichothecene mycotoxin. Analysis of a hose from a second Soviet mask showed the presence of several mycotoxins. In addition, a vegetation sample from Afghanistan shows preliminary evidence of the presence of mycotoxins. (See Annex A.)

Our suspicions that mycotoxins have been used in Afghanistan have now been confirmed. Reports during 1980 and 1981 described a yellow-brown mist being delivered in attacks which caused blistering, nausea, vomiting, and other symptoms similar to those described by "yellow rain" victims in Southeast Asia. Because of limited access to survivors who still exhibited symptoms, as well as great difficulties in collecting environmental and other physical samples from attack sites, we were unable to conclude with certainty in the March 22 report that mycotoxins were being used in Afghanistan. We have now concluded that trichothecene mycotoxins have been used by Soviet forces in Afghanistan since at least 1980.

A number of reports indicate that chemical attacks are continuing in 1982. While we cannot substantiate every detail, the pieces of evidence in these reports add up to a consistent picture. For example, a physician in a facility treating casualties among the *mujahidin* (resistance fighters) has reported that he treated 15 *mujahidin* for red skin lesions that he said were caused by Soviet chemical attacks in Qandahar Province in May-June 1982.

TABLE 1

Afghanistan: Reported Attacks, 1982

Date	Village Location	Method of Attack	Form of Material	Persons Killed	Persons Taken Ill
early Feb	north of Shindand	aircraft	yellow substance	4	?
Feb. 4, 5	south of Shindand	helicopter	yellow substance	0	?
Feb. 19	Badakhshan Province	aircraft	yellow crystals	?	?
May-June	Qandahar Province	helicopter rockets	black, yellow, white gases	3	15
June	Farah Province	aircraft bombs	red, black, white smoke	?	?
June 11	Qandahar Province	aircraft bombs	?	15	30
June	Baghlan Province	helicopter	?	?	?
July	Panjsher Valley	aircraft	nerve gas	0	0
Sept. 13	Lowgar Province	pumped from armored vehicle	gas	73	0
Sept. 20	Lowgar Province	pumped from armored vehicle	gas	?	?
Sept.	Lowgar Province	?	?	?	?
late Sept./ early Oct.	Baghlan Province	aircraft bombs	?	?	?

? = Undetermined

Three *mujahidin* died within 12 hours of one attack in the general area of Maharijat south of Qandahar. The *mujahidin* claimed that Soviet helicopters fired rockets that emitted black, yellow, and white gases on impact. The physician said that the surviving victims failed to respond to conventional medical treatment.

We have received reports that on September 20, 1982, Soviet soldiers poisoned underground waterways in Lowgar Province south of Kabul where the *mujahidin* were hiding. According to a *mujahidin* commander in Pakistan, a similar event occurred in the same province on September 13, 1982, resulting in the deaths of 60 adults and 13 children. These two independent accounts described a Soviet armored vehicle pumping a yellow gas through a hose into the waterways.[1]

[1]We know from other sources that Soviet chemical agent delivery methods include this technique, as reported, for example, by a Cuban emigre trained by the Soviets in the use of chemical weapons.

According to the accounts of the September 1982 attacks, the victims' bodies decomposed rapidly, and the flesh peeled away when attempts were made to move the bodies. Since 1979, *mujahidin* resistance leaders, refugees, journalists, and Afghan defectors have described chemical attacks causing almost identical symptoms. Most reports have described the skin as being blue-black after death. Although such symptoms seem bizarre, the large number of reports from a variety of sources since 1979 suggests that they cannot be dismissed (see our March 22 report, p. 16).

In 1982, a Soviet soldier who defected to the *mujahidin* said in an interview with a British journalist that a Soviet toxic agent, termed "100 percent lethal," causes the flesh to become very soft. The Soviet defector stated that the Soviets maintained stores of "picric acid" (probably chloropicrin, a potentially lethal tear gas), the "100 percent lethal" agent, and an incapacitating

agent near the cities of Qonduz and Kabul. The defector also reported that:

- Unidentified toxic agents had been used in June 1982 on the highway between Termez and the Salang Pass north of Kabul;
- The "100 percent lethal" agent was delivered by rockets; and
- "Picric acid" and an incapacitating agent were delivered by air dropped canisters.

The defector stated that the Soviets have been preoccupied with protecting the roads and that chemicals were sprayed by planes along the areas adjacent to highways. Chemical grenades reportedly have been used, but the data are inadequate to allow us to hypothesize about the contents, although some symptoms are indicative of mycotoxins.

The reports of rapid skin decomposition as quickly as 1–3 hours after death continue to concern us. There is no recognized class of chemical or biological toxin agents we know of that could affect bodies in such a way. If we assume occasional inaccuracies in reporting by journalists and survivors of attacks, it is possible that phosgene or phosgene oxime could cause such effects after 3–6 hours but with much less softening of tissues than is consistent with stories of "fingers being punched through the skin and limbs falling off." The reported medical effects of other toxic agent attacks are consistent with use of the nerve agent tabun. We have information that both phosgene oxime and tabun are stored by the Soviets in Afghanistan.

The British journalist, who interviewed the Soviet defector, also reported on two attacks described to him by the *mujahidin*, which have not yet been confirmed. One was an attack in the spring of 1982 on Kaiba, where Soviet soldiers reportedly shot victims already rendered unconscious by a gas; the other was in the summer of 1982 near Herat where Soviet troops reportedly loaded the bodies from a gas attack onto a truck and removed them. Reliable information indicates that the Soviets used chemical bombs against *mujahidin* forces in late September 1982 and in early October 1982 in Baghlan Province.

Our earlier findings are reinforced by several reports received this year about earlier attacks not covered in our March report:

- According to a former Afghan Army officer, in September 1981 a Soviet helicopter sprayed a yellow mist in Paktia Province (Sheikn Amir) causing 16 deaths. The survivors had bloody noses and tears; extensive bleeding was reported in those who died. The Afghan officer described a similar attack in Nangarhar Province during the same month in which four persons were killed.
- In early December 1981, according to interviews with survivors, 15 refugees attempting to escape to Pakistan were attacked by a helicopter using gas; four or five people were killed (the youngest and the eldest), while the rest became unconscious for 5–6 hours. The attack occurred about 60 kilometers northwest of Jalalabad.
- According to a Soviet soldier who served in Afghanistan in 1980 and personally observed the use of chemical weapons, the Soviets dispersed chemicals from fighter-bombers and assault helicopters. He said that an aircraft or helicopter first would drop a container and then, on a second run, drop a bomb, resulting in a mixture of two different chemicals that killed everything within the contaminated area. We believe that the soldier may have been describing the delivery of two separate chemical agents, an occurrence described by other eyewitnesses.
- An Afghan veterinarian recently has described an incident in May 1979 in which 20 people and a number of sheep were killed near Qandahar. Soviet lab technicians explained that the incident resulted from anthrax, but the doctor knew that the explanation did not fit the effects observed. Local Afghans told the veterinarian that Soviet vehicles had been in the area spraying a yellow/white powder before the incident.
- In June 1980, an airport official described seeing 200–300 gas containers painted in greens and browns at Qandahar Airport. The containers averaged 35–40 inches high and 26–30 inches in diameter. A subordinate reported three types of gases in the containers: one causing burning in the throat as well as suffocation; one causing what looked like smallpox and blistering; and one making victims tired and sleepy and unable to run or fight. Further, the subordinate stated that the containers were placed in special casings that were dropped from aircraft and exploded on impact, emitting a large cloud of smoke, usually yellow but sometimes other colors. He said he had heard *mujahidin* describe these gas attacks and had himself seen animals that had been killed by the gases. We lend credence to this report because we know from other evidence that chemicals are stored at Qandahar Airport, which is an important staging area for Soviet military operations.
- Finally, information received this year revealed that a Soviet adviser inspecting sites for housing Soviet troops before the Afghan invasion indicated that Soviet chemical defense forces entering Afghanistan would bring in extensive stores of toxic materials. The adviser indicated that a proposed garrison in Kabul would be inappropriate for the Soviet chemical defense unit because the materials it transported could devastate the city if an accident occurred.

Laos

H'Mong refugees, recounting details of toxic agent attacks and exhibiting severe medical symptoms from exposure to the agents, fled to Thailand every month from January through June 1982. They brought out more samples contaminated by a yellow, sticky substance described as a "yellow rain" dropped by aircraft and helicopters on their villages and crops. We have preliminary reports on attacks as recent as October 1982. We now know that the yellow rain contains trichothecene toxins and other substances that cause victims to experience vomiting, bleeding, blistering, severe skin lesions, and other lingering signs and symptoms observed by qualified physicians. Experts agree that these people were exposed to a toxic agent and that no indigenous natural disease, plant, or chemical caused these unique physical effects.[2]

Laboratory analyses of blood samples from these victims and studies on experimental animals have shown that trichothecene toxins are retained in the body for much longer periods of time than previously thought. Scientific research has shown that the multiple-

[2]See Canadian report to the United Nations: "Study of the Possible Use of Chemical Warfare Agents in Southeast Asia," Dr. H. B. Shiefer, University of Saskatchewan.

phase distribution pattern in animals includes a secondary half-life of up to 30 days. We believe that the severe skin lesions observed on victims by doctors are also relevant. Victims whose blood proved on analysis to have high levels of trichothecene mycotoxins exhibit such skin lesions.

Descriptions of the 1982 attacks have not changed significantly from descriptions of earlier attacks. Usually the H'Mong state that aircraft or helicopters spray a yellow rain-like material on their villages and crops. In some reports the symptoms are similar to those described in our March 22 study, and we attribute them to the use of trichothecene toxins. However, in many cases there was no bleeding, only abdominal pains and prolonged illness. These symptoms, described in previous years, suggest that another agent or combination of agents is still being used. The explanation is complicated because different symptoms are ascribed to men, women, children, and animals. It is possible that different agents, lower concentrations of the same agents, or climatic conditions have affected the efficacy of the agents.

Medical personnel in Lao refugee camps in Thailand were much better organized in 1982 to screen victims than in past years. Doctors now routinely use extensive questionnaires and conduct comprehensive medical examinations, including some onsite, preliminary blood analysis. Skilled paramedical personnel oversee preparation of blood and serum samples for proper transport and shipment to the United States or other countries for chemical analysis. Some patients with active symptoms are now being monitored extensively over time.

A number of blood samples have been collected from Laos for analysis in the United States. All biological specimens were drawn by qualified medical personnel, and samples were refrigerated until analyzed in the United States. Analysis of these samples shows that trichothecene mycotoxins continue to be used against H'Mong villages. In addition to blood and urine specimens from victims exposed to chemical warfare, we have collected additional physical samples this year. These physical samples consist of more residue of yellow rain containing mycotoxins from the same attacks that yielded human biological specimens positive for these same toxins. (See Annex A.)

TABLE 2

Laos: Reported Attacks, 1982

Date	Village Location	Method of Attack	Form of Material	Persons Killed	Persons Taken Ill
Jan. 3, 6, 11	Phou Bia*	helicopter spray	yellow rain	0	?
Jan. 4	Phou Bia	aircraft	green chemical**	?	?
Jan. 9	Phou Bia	artillery	white/yellow cloud	0	?
Feb. 13	Phou Bia	aircraft spray	yellow rain	0	?
Feb. 21, 22	Phou Bia	helicopter	white powder	0	?
Feb. 28	Phou Bia	helicopter	white powder	10	30
Mar. 10	Phou Bia	helicopter, aircraft	red, yellow/ white clouds	many	many
Mar. 17	Phou Bia	helicopter spray	yellow rain**	20	?
Mar. 25	Phou Bia	helicopter spray	yellow rain**	1	40 families
late Mar., early Apr.	Phou Bia	aircraft	yellow rain**	27	many
Apr. 1	Phou Bia (3 villages)	?	yellow rain	many	4
Apr. 17, 18, 30	Phou Bia	aircraft	yellow rain	10	?
Apr./May	Phou Bia	aircraft, helicopters	yellow rain	0	many
May 20	Phou Bia	aircraft	yellow rain	4	100
May 24	Phou Bia	aircraft	yellow rain	9	many
May	Phou Bia	poisoned river	?	0	many
June 17	Phou Bia	aircraft spray	yellow rain	4	many

? = Undetermined.
*Phou Bia refers to mountain area where H'Mong villages are located.
**Samples from this attack contained mycotoxin (see Annex A).

The number of reported attacks in Laos in 1982 did not differ significantly from the frequencies reported for comparable periods in the years 1977 through 1981. Reported fatalities per attack during 1981 and 1982 showed an apparent decrease, suggesting the possibility that less lethal toxic agents, or lower concentrations of the same agents, are now being used. This apparent decrease, however, was not statistically significant and could have been caused by a number of other factors, including the following:

- Due to emigration and the high number of fatalities since at least 1976, the H'Mong were living in smaller, more scattered communities.
- H'Mong survivors still in Laos were warier and quicker to take cover and to use rudimentary protective measures at the first sign of attack.
- The H'Mong were not taking time to count victims—this is supported by the existence of very few reports that indicate the precise number of people affected by a toxic agent attack.

As stated in the March report, the Soviet Union maintains in Laos significant numbers of advisers who provide maintenance assistance, technical support, and training in both conventional and chemical warfare. A former Lao transport pilot who defected early this summer has described the aerial movement, under Soviet supervision, of toxic agents within Laos.

Kampuchea

Most reports of toxic attacks in Kampuchea for the period 1978–June 1982 come from Democratic Kampuchean (DK) sources, including interviews with DK military personnel. Evidence from other sources confirmed most of these reports. In 1982, most reported attacks occurred near the Thai border, making it easier to obtain samples and other direct evidence of toxic agent use.

In the first 6 months of 1982, the number of reported toxic agent attacks in Kampuchea was about half the number reported during the same periods in 1980 and 1981. The number of reported deaths per attack also decreased, but data were insufficient to determine if this decrease was statistically significant. We also have preliminary reports on attacks through early November 1982.

In February and March 1982, several attacks occurred just across the Kampuchean border in Thailand. Analysis of samples collected from the attacks was performed in Canada, Thailand, and the United States. Although differing sampling techniques give rise to significant sampling error and lead to slightly different analytical results, both the U.S. and Thai analysts, using different analytical techniques, found trichothecene mycotoxins in their samples.[3] The Canadian team investigating these attacks has published a detailed medical assessment of the victims' symptoms; it concluded that illness had in fact occurred and was caused by a toxic agent, although preliminary tests for trichothecenes proved inconclusive in the Canadian sample.

Blood and urine samples from Kampuchean victims of a toxic agent artillery attack on February 13, 1982, contained trichothecene toxins (Annex A). In addition, post-mortem tissue from a victim of this same attack confirmed the presence of trichothecene toxins (Annex B). Analysis of additional samples showing the presence of trichothecenes taken from other attacks is also found in Annex A.

The Vietnamese conducted toxic agent attacks this year against another resistance group, the Kampuchean People's National Liberation Forces. On several occasions in March-May 1982, the resistance camp at Sokh Sann was hit with toxic artillery shells and bombs. Samples of contaminated vegetation and yellow residue from these attacks

TABLE 3

Kampuchea and Thailand: Reported Attacks, 1982

Date	Village Location	Method of Attack	Form of Material	Persons Killed	Persons Taken Ill
Kampuchea					
Feb. 13	border near Khao Din	artillery	?*	1**	100
Feb. 23	border near Pailin	spread along border	yellow powder	0	?
Mar. 3	Battambang Province	artillery	?	0	?
Mar. 5, 7	Pailin area	aircraft spray, artillery	white powder*	0	10
Mar. 7–11	Sokh Sann	artillery, ground spray	yellow substance	0	many
Mar. 10	Battambang Province	aircraft	toxic substance	25	12
Mar. 10–13	Battambang Province	aircraft, artillery	toxic substance	30	?
Mar. 17	Sokh Sann	artillery	yellow/white powder	0	many
Mar. 24	Battambang Province	poisoned water	yellow powder	4	?
Apr. 29	Battambang Province near border	aircraft spray	yellow powder	3	7
May 23, 26	Sokh Sann	aircraft spray	?	0	?
June	Preah Vihear Province	poisoned food and water	?	2	many
June 24	border near Nong Chan	mortar	yellow cloud	0	4
Thailand					
Feb. 19	Pong Nam Ron District	aircraft spray	yellow powder*	0	many
Mar. 3	southeast of Pong Nam Ron District near border	aircraft (powder wind-blown over border)	powder	0	many
Mar. 5	Pong Nam Ron District	mortars	gray/black smoke	0	18
Mar. 6, 8	southeast of Pong Nam Ron District near border	aircraft spray	yellow powder	0	many

? = Undetermined

*Samples from this attack contained mycotoxin (see Annex A).

**See Annex B for detailed analysis of autopsy results of the victim.

[3]It was thought initially that a harmless yellow powder had been dropped on Thai villages as part of a disinformation campaign attempting to discredit U.S. sample analysis results. Within days of such an attack, the Thai Ministry of Health announced that only ground-up flowers had been found. However, Thai officials later stated that further analysis showed traces of toxin and that the earlier Health Ministry announcement was based on incomplete investigation.

are now being analyzed. Attacks occurred in Kampuchea through June 1982, providing new samples; qualitative tests indicate that the presence of trichothecenes is probable. The results of confirmatory analyses are pending.

Several Vietnamese military defectors from Kampuchea have provided valuable information in 1981 and 1982 on chemical weapons use and on the Vietnamese chemical warfare program and have reported that some types of agents are supplied by the Soviet Union. Information from other sources also confirms our earlier view that the Vietnamese possess toxic agent munitions and are equipping their own troops with additional protective equipment.

ANNEX A

Analysis of Samples for Chemical Warfare Agents and Toxins

The identity of the agents and toxins being used in Laos, Kampuchea, and Afghanistan cannot be determined without collection and analysis of at least one of the following: environmental or physical samples contaminated with agent, the munitions used to deliver agents, or biological specimens from attack victims.

The likelihood of detection of chemical agents and toxins in contaminated samples depends on a number of factors. These include the persistency of the agent; the ambient temperature; rainfall; wind conditions; the media on which the toxic agent was deposited; and the time, care, and packaging of the sample from collection to laboratory analysis. Many standard chemical warfare agents and toxins disappear from the environment within a few minutes to several hours after being dispersed. These include, for example, the nerve agents sarin and tabun, the blood agents hydrogen cyanide and cyanogen chloride, the choking agents phosgene and diphosgene, and the urticant phosgene oxime. Other standard agents—such as the nerve agents VX and thickened soman and the blistering agents sulfur mustard, nitrogen mustard, and lewisite—may persist for several days to weeks depending on weather conditions. The trichothecene toxins are stable under laboratory conditions but degrade in field samples due to metabolism by micro-organisms contained in the sample. To maximize the chances of detection, sample collections should be made as rapidly as possible after a toxic agent assault; with many agents this means minutes to hours. Given the situation in Southeast Asia and Afghanistan, this usually has not been possible. Although numerous samples were collected, few held any realistic prospect for yielding results. However, when immediately collected and properly handled and using the advanced technology now available, trichothecenes may be detected in both physical and biological materials up to several months after the attack.

Samples have been collected from Southeast Asia since mid-1979 and from Afghanistan since May 1980. To date, more than 350 individual samples—of greatly varying types and utility for analytical purposes—have been collected and analyzed for the presence of traditional chemical agents. About 100 additional samples are pending completion of analysis. All environmental and nonmedical samples were submitted to the U.S. Army Chemical Systems Laboratory for analysis for traditionally recognized chemical warfare agents and other toxic materials. Tissue specimens and body fluids from attack victims were submitted to the Armed Forces Medical Intelligence Center. Under the sponsorship of that organization, the biomedical specimens were analyzed for the presence of trichothecene mycotoxins and other toxins by Dr. Chester Mirocha, University of Minnesota; Dr. Joseph Rosen, Rutgers University; and Dr. Tim Phillips, Texas A&M University.

To date, biomedical samples (blood, urine, and/or tissue) from 33 alleged victims have been screened. Specimens from 16 of these individuals show the presence of trichothecene mycotoxins. In addition, six environmental samples from alleged attack sites have been analyzed by Dr. Mirocha. Five show the presence of unusually high concentrations and combinations of trichothecene mycotoxins.

Evidence of Chemical and Toxin Agent Use in Southeast Asia and Afghanistan, 1982

Sample	Result
Laos	
blood	trichothecene toxin
blood (post-mortem)	trichothecene toxin
yellow residue	trichothecene toxin
vegetation	trichothecene/ aflatoxin B1
Kampuchea/Thailand	
blood	trichothecene toxin
urine	trichothecene toxin
tissue (autopsy)	trichothecene/ aflatoxin B1
yellow residue	trichothecene toxin
vegetation	trichothecene toxin
water	trichothecene toxin
water	cyanide
Afghanistan	
gas mask (two sets)	trichothecene toxin
vegetation	trichothecene toxin

Details concerning samples analyzed since the March report—including the circumstances of their collection, analysis, and the results—are provided in this annex. Results of analysis of earlier samples were included in our March 22, 1982 report.

POSITIVE SAMPLE RESULTS

Afghanistan

One-quarter of the external surface of a Soviet gas mask, obtained near Kabul in September 1981, was recently processed for analysis, employing techniques not previously used, and showed the presence of T-2 toxin. This analysis has been verified by two other laboratories. Similar analysis of material from the hose connections of another Soviet gas mask removed from a dead Soviet soldier in December 1981 in Afghanistan is indicative of the presence of the trichothecene toxins, T-2, DAS, verricarol, and another type of mycotoxin—zearalenone. It is believed that these

protective masks were worn during operations in which a toxin agent was used.

Preliminary analysis of a third sample acquired in February 1982 also indicates the presence of trichothecenes.

Laos

1) Blood samples were drawn from an ill H'Mong couple on March 21, 1982, by a physician in the Ban Vinai refugee camp. The victims were exposed to toxin agent attacks on November 11, 1981, and January 4, 1982. They remained ill and under treatment on March 21, 1982, when blood samples were obtained. During the November 1981 attack, an aircraft sprayed a yellowish agent. Although no one died in the village, symptoms such as bloody diarrhea were experienced by most of those exposed. In the January 1982 attack, a greenish chemical was sprayed from an airplane. Vomiting with blood, bloody diarrhea, blurred vision, chest pain, eye irritation, and skin rash were reported. Lingering effects included rash, pain in the joints, and fatigue. The blood samples were analyzed for three trichothecene toxins: DAS, T-2, and HT-2. The blood sample from the male was found to contain 13.5 ppb T-2 toxin. The female was negative for all toxins analyzed.

2) Three blood samples were drawn by a U.S. physician on April 17, 1982, from three H'Mong refugees: Bloc Her, an 8-year-old boy; Tong Her, a 6-year-old boy; and Xia Sue Xiong, a young girl. They were among a group exposed to a toxic agent attack in late March 1982 in Laos. The agent used was described as being yellow to reddish brown. It was sticky and dried to a powder. Bloc Her had been severely ill with bloody diarrhea and coughing of blood. Xia Sue Xiong was suffering from bloody diarrhea and abdominal pain. The blood samples were analyzed for three trichothecene toxins: DAS, T-2, and HT-2.

Trichothecene Toxin Analysis

Victim	DAS	T-2	HT-2
Bloc Her	negative	negative	negative
Tong Her	negative	110 ppb	296 ppb
Xia Sue Xiong	negative	46 ppb	negative

ppb = parts per billion

3) Post-mortem blood samples were taken from a 25-year-old H'Mong refugee who had been admitted earlier to a refugee hospital at Ban Vinai, Thailand. Just before death he had suffered from a massive gastrointestinal hemorrhage. He had claimed exposure to a toxic agent attack sometime earlier in Laos. The blood was drawn in the hospital on April 17, 1982, and analyzed for three trichothecene toxins: DAS, T-2, and HT-2.

Trichothecene Toxin Analysis

Specimen Type	DAS	T-2	HT-2
heparinized blood	negative	15 ppb	19 ppb

4) Blood was drawn on April 6, 1982, from Neng Xiong, a H'Mong refugee in Thailand. She was suffering from the effects from a toxic agent attack that occurred in Phou Bia, Laos, on March 25, 1982. The entire population of the village (40 families) suffered from vomiting, fever, backaches, headaches, and chest pain after a helicopter dropped a yellowish agent. Many villagers also developed swollen eyes. It was reported that one woman and several animals died. Neng Xiong's blood was analyzed for three trichothecene toxins: DAS, T-2, and HT-2.

Trichothecene Toxin Analysis

Specimen Types	DAS	T-2	HT-2
heparinized blood	negative	100 ppb	8 ppb
non-heparinized blood	negative	33 ppb	34 ppb

5) A H'Mong refugee reported being subjected to a toxic agent attack on March 17, 1982, in Phou Bia, Laos. The agent, which "looked like yellow rain," was sprayed by a helicopter at low altitude. The sticky yellow spots dried to a powder in 3–4 hours. Immediately after the attack, the victim developed stomach and chest pains and vomited. Vomiting with blood began later and continued over the next 24 hours. Other symptoms included headache, shortness of breath, dizziness, eye irritation, and vision disturbances. The refugee also developed a rash and blisters. Blood samples were drawn by a physician at Ban Vinai refugee hospital in Thailand on March 31, 1982. The samples were analyzed for three trichothecene toxins: DAS, T-2, and HT-2.

Trichothecene Toxin Analysis

Specimen Types	DAS	T-2	HT-2
heparinized blood	negative	19 ppb	negative
non-heparinized blood	negative	3 ppb	2 ppb

6) Results of analysis of two environmental samples from attack sites in Laos were reported in our March 22 report and are not repeated here. An additional set of environmental samples taken from an allegedly contaminated area in Laos near Phu He was obtained for analysis. Although symptoms were manifested in individuals collecting and handling the sample, no trichothecenes were detected upon analysis.

Kampuchea/Thailand

1) On February 13, 1982, at least 100 Kampuchean soldiers were subjected to an artillery-delivered toxic attack by Vietnamese forces and became ill. The attack took place near the village of Tuol Chrey in an area north of Khao

18-467 O - 83 - 4

Din, about 300 meters from the Thai-Kampuchean border. One individual subsequently died (see autopsy results, Annex B). Reported symptoms included burning eyes, blurred vision, shortness of breath, chest pains, vomiting, and vertigo. Some victims also trembled and generally felt weak. Blood and urine samples were taken from a number of victims at various times after the attack as well as from a control group of individuals living under similar conditions but not subject to the toxic agent attack. Blood and urine samples from the control group were negative for all analyzed toxic agents, including trichothecene toxins.

On February 14, 1982, 1 day after the attack, blood samples were taken from two victims: Pen Nom and Prek Reth. On February 15, a urine sample was taken from Pen Nom, while on February 16, a urine sample was taken from Prek Reth. Both blood and urine samples were analyzed for the presence of the trichothecene mycotoxins T-2 and HT-2.

Trichothecene Toxin Analysis

Victim	Specimen	T-2	HT-2
Prek Reth	blood	18 ppb	22 ppb
	urine	negative	negative
Pen Nom	blood	11 ppb	10 ppb
	urine	trace	18 ppb

On March 4, 1982, 19 days after the incident, some victims still showed effects of the attack and were being treated in Nong Pru hospital in Kampuchea. Further blood samples were drawn at that time from Prek Reth and five additional victims.

Trichothecene Toxin Analysis

Victim	T-2 Toxin
Prek Reth	negative
Kim Ving	7 ppb
Mau Sereth	negative
Seng Nem	negative
Ching Soeum	negative
Chem Ron	3 ppb

Analysis of tissue samples from a victim of the February 13 attack is described in Annex B.

2) On March 5, 1982, a small Vietnamese aircraft sprayed a white powder in an area near Pailin, Kampuchea. On March 6, 1982, 10 of a group of 15 Kampucheans were unable to continue walking due to illness after passing through the area. Symptoms included nausea, vomiting, shortness of breath, blurred vision, diarrhea, bloody discharge from the nose, and burning sensation in the chest and abdomen. A second attack occurred on March 7, 1982, when some of the same Kampucheans were subjected to Vietnamese toxic artillery shelling. The agent produced nausea, dry mouth, and blurred vision and also caused loss of consciousness and muscle twitching. Despite medical treatment, a number of the victims died.

Samples were taken from three survivors exposed to the contaminated area on March 6 and 7. Blood and urine were taken on March 13, 1982.

Trichothecene Toxin Analysis

Victim	Specimen*	DAS	T-2	HT-2
Neung Hon	urine	negative	5 ppb	2 ppb
	blood	negative	7 ppb	negative
Chan Saran	urine	negative	4 ppb	1 ppb
	blood	negative	negative	8 ppb
Bun Thoeun	urine	negative	22 ppb	7 ppb
	blood	negative	negative	negative

*Blood samples were heparinized.

3) A sample of contaminated vegetation was obtained following spraying by a Vietnamese aircraft in Pong Nam Ron District near the Thai-Kampuchean border on February 19, 1982. Analysis of this sample for known chemical agents was negative. However, the trichothecene toxin T-2 was present at a level of 86 ppb. DAS was also present at 30 ppb. The sample was of insufficient size to analyze accurately for the toxins nivalenol and deoxynivalenol.

ANNEX B

Autopsy Results of a Chemical Warfare Attack Victim in Kampuchea

Chan Mann was one of several victims of a February 13, 1982, toxic agent attack in the area of Khao Din. The victim, being treated at Nong Pru Hospital, reportedly made a brief recovery on March 12 and 13, followed by a relapse when he became anuric, feverish, restless, and slightly jaundiced. On March 16, he lapsed into a coma and died. A urinary catheter was inserted approximately 4 hours before death, but only minimal blood-tinged urine was obtained. Shortly before death the victim vomited blood. Kampuchean physicians performed a necropsy. Tissue sections of heart, esophagus/stomach, liver, kidney, and lung were taken and fixed in formaldehyde. Tissue samples were given to both U.S. and Canadian officials for analysis.

The samples delivered to the United States were submitted to several U.S. laboratories for gross, microscopic, histopathological, and chemical-toxicological analysis.

Results of Analysis of Tissue Samples for DAS, T-2, and HT-2[a]

Material	Amount (g)	Toxins Detected DAS[b]	T-2	HT-2
Heart	7.9	—	—[d]	1 ppm
Stomach	13.5	—	25 ppb	4 ppm
Liver	9.5	—	—	—
Kidney	10.4	3 ppm[c]	7 ppb	—
Lung	4.5	—	9 ppb	—
Intestine	5.3	—	88 ppb	10 ppb

[a]DAS (Diacetoxyscirpenol), a trichothecene toxin; T-2, a trichothecene toxin; HT-2, a metabolic product of T-2.

[b]DAS was used as internal standard—i.e., DAS was added to each tissue sample as a standard to check accuracy of analysis. Only the kidney had a concentration of DAS greater than the amount added.

[c]Toxins were not detected. Concentration of DAS was no greater than the added internal standard.

[d]Endogenous DAS in sample detected in concentration greater than the standard.

Note: Tissues were analyzed for trichothecene toxins by Dr. C.J. Mirocha, University of Minnesota. A parallel analysis performed by Dr. J. Rosen, Rutgers University, also revealed the presence of high levels of trichothecene toxins.

A high incidence of natural aflatoxin contamination of food in Southeast Asia has been well documented. Linderfelser and coworkers (1974) have shown that aflatoxin and T-2 toxin in combination have a synergistic effect and, therefore, it was of interest to determine the extent of aflatoxin in tissue of this individual.

Results of Analysis of Samples for Aflatoxin

Material	Weight of Sample (g)	Sample	
		Actual (ng/g)[1]	Adjusted[2] (ng/g)
Stomach	3.04	19.8	22.5
Liver	3.00	20.2	23.2
Kidney	7.50	15.3	17.4
Intestine	3.02	11.2	12.7

[1]Nanograms per gram.
[2]Values adjusted on basis of 84% recovery—that portion of aflatoxin found when a known amount is added to the sample.

Note: Aflatoxin analyses were conducted by Dr. Phillips, Texas A&M University.

Levels of aflatoxin detected in the tissues were so high that it seemed prudent to investigate the possibility that this individual exposure to aflatoxin was not due to a natural contamination but may have been related to the chemical attack. To this end, portions of the sample of yellow rain from Laos previously shown to contain 143 ppm of T-2 toxin and 27 ppm of DAS were submitted to Dr. Mirocha and Dr. Phillips for analysis for aflatoxin B1. Independent thin-layer chromatography and high-performance liquid chromatography analyses were negative for aflatoxin, supporting a hypothesis that this toxin is not always a component of a yellow rain sample and that the victim's exposure to aflatoxin may have been due to contamination of the food source. It does not, however, rule out the possibility that aflatoxin is a component of some yellow rain attacks. Preliminary analysis of some more recent yellow rain samples indicates the presence of aflatoxin not consistent with a natural contamination. In any case, the findings of aflatoxin in these tissues is important since the high incidence of exposure to natural outbreaks of aflatoxin contamination in Southeast Asia may induce a greater susceptibility to trichothecenes in this population.

Portions of each tissue sample were submitted to Dr. Charles Stahl, University of Tennessee Medical School, for histopathological examination. A summary of the pathology found included: hemorrhage into the heart tissue with evidence of cell destruction and inflammation, cirrhosis of the liver, hemorrhage and cellular destruction of kidney tubules, hemorrhage in the bronchi, and congestion and destruction of the lung. The details of these results and similar findings by other pathologists are consistent with results of analysis of animals exposed to trichothecenes.

No single post-mortem finding proves cause and effect of toxin exposure and death, but these data taken together provide objective evidence that:

- Reports from witnesses of yellow rain attacks are valid and that bleeding sometimes occurs in the lung, stomach, intestine, and kidney or bladder.
- Persons already debilitated by disease or exposure to other toxins have a greater risk of death from trichothecene toxicosis.
- Microscopic examination shows that tissue damage occurs in humans after moderate-to-heavy exposure to trichothecenes. The damage is similar to that found in experimental animals.
- Microscopic damage persists for 1 month or longer.
- Trichothecenes are known to cause long-term damage to rapidly dividing tissue. These toxins accumulate and persist at least in the organs that were examined.
- Aflatoxin found in the tissues may be foodborne and is not necessarily a component of the yellow rain substance. However, aflatoxins and trichothecene toxins act synergistically, and they could be components of a toxic crude extract mixture. Emerging data from several sources lend credibility to such a hypothesis; therefore, investigation seems warranted.

ANNEX C

Discussion of Analytical Findings[a]

The finding of T-2 toxin and HT-2 toxin in blood, urine, and tissue samples from yellow rain victims is highly significant in view of the fact that no trichothecenes could be detected in similar samples from the control population who were not exposed to yellow rain. The finding of such high levels of trichothecenes weeks after exposure is surprising and raises questions concerning the distribution, metabolism, and excretion of these toxins as well as their long-term effects.

Only limited research concerned with elimination rates of the trichothecenes has been conducted. Ueno, et al., 1971, reported that orally administered fusarenon-x was rapidly distributed to the tissues and reached peak levels by 3 hours after dosing. The kidney was believed to be the major organ of excretion. Matsumoto, et al., 1978, conducted studies with T-2 toxin which led him to conclude that the liver and biliary system were the major organs of T-2 excretion. Chi, et al., 1978, administered oral doses of T-2 to broiler chickens. Peak tissue levels were reached by 4 hours after dosing, and the liver contained the greatest amount of toxin. By 12 hours after dosing, however, the muscle, skin, and bile contained the highest amounts of detectable toxin. By 48 hours, 82% of the administered dose had been excreted. Robinson, et al., 1979, showed that T-2 toxin was excreted into cow milk at levels up to 160 ppb after daily administration of 0.6 mg/kg doses.

Studies concerned with metabolism of the trichothecenes have also been limited in number. Yoshizawa, et al., 1980, reported that in rat liver *in vitro* studies with the S-9 fraction of rat liver homogenates, HT-2 made up 50% of the metabolic products. Other metabolites included TMR-1 (19%), TMR-2 (2%), and T-2 tetraol (4%). In *in vivo* studies, HT-2 was one of the major products eliminated in the excreta of chickens (Yoshizawa, et al., 1980) as well as urine, feces, milk, and blood of dairy cattle (Yoshizawa, et al., 1981).

The finding of T-2 toxin and HT-2 in the blood and tissue of humans weeks after their exposure to the toxins would seem to indicate that enough toxin remains bound in body tissues to allow detection by sensitive instrumentation. Trichothecenes have been shown to bind to ribosomal proteins (Ueno, 1975) and to react with sulfhydryl containing compounds such as glutathione (Foster, et al., 1975) and with proteins such as albumin (Chu, et al., 1979). It would appear that although most of the toxin would normally be expected to be excreted within 48 hours after exposure, small amounts of the toxin and its metabolites remain bound to body tissues for much longer periods. The

[a]Based on excerpts from a paper by Dr. C.J. Mirocha and Dr. S. Watson, presented at an international symposium on mycotoxins in Vienna on September 1, 1982.

size of the dose administered and the route of exposure may have a significant effect on the proportion bound, since a sudden, rapidly absorbed, massive dose may overload normal excretion and detoxification mechanisms, resulting in greater tissue binding of the toxin. Similar apparent long-term storage of mycotoxins has been reported previously for aflatoxin B. Although most of the administered dose of aflatoxin is rapidly metabolized, Shank, et al., 1971, demonstrated in studies of monkeys that unmetabolized aflatoxin B could be detected up to 6 days after administration of a sublethal dose.

Additional significant findings lie in the trichothecenes found in the leaf samples (T-2, DON, nivalenol) and yellow powder (T-2, DAS). The concentrations found and their combination are not normally found in nature and it would appear that these mycotoxins found their way into the environment by the intervention of man. The most compelling evidence is the presence of T-2 and DAS in the yellow powder. Both toxins are infrequently found in nature and rarely occur together. In our experience copious producers of T-2 toxin (*F. tricinctum*) do not produce DAS and, conversely, good producers of DAS (*F. roseum* 'Gibbosum') do not produce T-2. This is also supported by our experience that a good producer of DON does not produce T-2 or DAS but could produce nivalenol. Thus, we have more than just the quantity of toxins produced to explain, but also the kinds that respective species and their isolates produce. Theoretically, it is possible to genetically manipulate or select an isolate that would produce copious amounts of two or more of these toxicants, but this would require a sophisticated research effort and sophisticated technology based on experience.

It is difficult to explain the presence of trichothecenes on leaf surfaces. Fusarium is not a leaf pathogen, and so we would not expect it to colonize leaves indiscriminately. Fusarium does colonize the roots and vascular tissue (causes wilt diseases) of some plants, and it would have to produce the toxins *in situ* and translocate them to the leaves. This has never been demonstrated in the pathogenesis of Fusarium-infected plants. If a pathogen like *F. oxysporum* f. *lycopersici*, pathogenic to tomatoes, were to produce trichothecenes and translocate them to the leaves, one would not expect such high concentrations and combinations of toxins. Moreover, we are not certain that pathogenic isolates of the latter produce trichothecenes during pathogenesis. It is a well known plant pathological principle that production of toxins by pathogens in laboratory culture does not signify that these toxins also are produced in the host.

Apart from the controversy of the trichothecenes occurring on the leaves, it is difficult to imagine a reasonable explanation for the appearance of T-2 and DAS in the yellow powder. To those who claim that they dropped onto the soil and rocks from overhanging leaves, this is contrary to any known facts about trichothecene occurrence or distribution. The burden of proof remains with those alleging such an unlikely hypothesis.

The finding of T-2 toxin, diacetoxyscirpenol, deoxynivalenol, zearalenone, and *Fusarium* pigments in leaves, water, yellow powder, and fragments originating at sites of yellow rain attacks in Southeast Asia and their absence in background samples (leaves, corn, rice, water, soil) from areas not exposed to yellow rain strongly implicates their use as warfare agents. Moreover, the finding of T-2 toxin and HT-2 toxin (a metabolite of T-2 toxin in animals) in the blood, urine, and tissue of victims of these attacks provides unequivocal evidence of their use as weapons.

• • • •

Details of the experimental procedures used in these analyses were presented at the Society of Toxicology meeting in Louisville, Kentucky, on August 16, 1982; at an international mycotoxin symposium in Vienna, on September 1, 1982; and at the Association of Analytical Chemistry meeting in Washington, D.C., on October 28, 1982.

Two scientific manuscripts describing those analyses have been submitted for publication in refereed journals and other studies pertaining to nongovernmental analyses are in press. ■

Published by the United States Department of State · Bureau of Public Affairs
Office of Public Communication · Editorial Division · Washington, D.C. · November 1982
Editors: Norman Howard and Colleen Sussman · This material is in the public domain and may be reproduced without permission; citation of this source is appreciated.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1982 - 381-412 - 488/460

Bureau of Public Affairs
United States Department of State
Washington, D.C. 20520

Official Business

If address is incorrect please indicate change
Do not cover or destroy this address label ►

Postage and Fees Paid
Department of State
STA-501

U.S. MAIL

Senator PRESSLER. You have done the timing perfectly. I have two pages of questions for you, but I must recess this hearing. If you are not here when I return, I will certainly understand. This day has fallen apart a little bit for all of us, and you are very busy today.

I want to thank you very much for taking the time, for changing from 11 to 2:30. I will be back in approximately 15 minutes. Senator Percy may be here sooner. Do not feel compelled to stay, but I am going to go do my duty and come back as quickly as I can. Excuse me.

[Recess.]

The CHAIRMAN [presiding]. I just came by to give my opening statement. I think I will give that opening statement and then have you continue, Secretary Eagleburger.

I wish to commend Senator Larry Pressler for his sustained and active interest in developing a full record on this issue. Senator Pressler chaired the first Senate hearing on this matter in November of 1981 and has helped raise the level of interest and the quality of information considered by Members of the Senate.

I received a letter recently from an individual who said, Senator, why make public the evidence on chemical warfare? Doesn't this only undermine arms control? I simply could not disagree more strongly. We cannot blind ourselves to the evidence. Furthermore, arms control agreements must be verifiable and making evidence public may serve to strengthen the verification provisions of future agreements.

Former skeptics have now concluded that chemical warfare is being waged against the resistance fighters in Afghanistan and against populations of hill tribesmen in Laos and soldiers and unprotected people in Kampuchea. Now there are three basic questions which must be resolved: How can remaining skeptics be convinced? When will chemical warfare be ended? And what is the implication for arms control of this continuing chemical warfare?

The Soviet Union would like nothing better than to hide its dismal record on human rights in general and its use of chemical weapons in particular. Therefore, these hearings add to the record of information on this urgent matter.

Our witnesses today are presenting their own observations and conclusions based on the evidence, and I hope that the media here and elsewhere will not consider this to be a routine hearing. There should be sustained interest in this serious subject.

It is so important for the public and governments to be kept informed of what is happening, when such a gross violation of internationally recognized human rights and of an existing arms control treaty is occurring. Influencing the Soviets to bring an end to the horror of this chemical warfare can be assisted if new and indisputable information is gathered and disseminated widely.

The United States has a role to play in gathering the information about chemical warfare. Influential media, including the Wall Street Journal, ABC–TV, and others, have contributed actively to the effort to bring attention to this issue. Some private voluntary agencies, particularly Dr. Amos Townsend of the International Rescue Committee—who will be at the witness table today—have done outstanding work.

Others have not been so helpful or cooperative in the global effort which is necessary here. This is not an issue which needs to be char-

acterized as a conservative issue or a liberal issue; it is a universal concern. And keeping public attention on reports of chemical warfare is not only important—it is the right thing to do.

Secretary Eagleburger, unfortunately, because the time ran several hours beyond our anticipation this morning on the confirmation hearing on Ambassador Adelman, we have our afternoon jammed up. I have the same problem Senator Pressler has, with appointments piling up. We will try to keep someone here and I would suggest that you continue. I hope we will not have to interrupt, but possibly we will.

Again, we appreciate very much your presence here today. Were you in the middle of your testimony?

Secretary EAGLEBURGER. I finished my opening statement, Mr. Chairman. I read it faster than I have ever read anything before in my life, but I got through it in 10 minutes.

The CHAIRMAN. Then, given the less than conclusive determination of the United Nations' "yellow rain" investigation, does the administration still consider the United Nations an effective forum for discussion of the issue?

Secretary EAGLEBURGER. Yes, sir, we do, I think for several reasons. First of all, I think it is important to remember that in the U.N. investigation that took place, the investigators were not permitted to visit Afghanistan, Kampuchea, and Laos. By that very fact their findings had to be less than precise. Nevertheless, the report that was issued by the United Nations indicated that the facts needed to be taken seriously.

Beyond that, Mr. Chairman, I think it is terribly important right now to recognize that it is indeed third world countries, which make up the vast majority of the United Nations who are the object of the use of these chemical and toxin weapons. And I think we have seen substantial evidence in Geneva, where we recently presented 24 pages of really very complete ideas on a chemicals weapons ban, and we have seen a good response to that from these nations.

I think we are seeing growing interest in and concern about the whole subject and yes, I would think we should continue in the United Nations. I think the atmosphere there is improving in terms of what we are trying to demonstrate.

[The above referred to material follows:]

U.S. DETAILED VIEWS ON THE CONTENTS OF A CHEMICAL WEAPONS BAN, SUBMITTED TO THE COMMITTEE ON DISARMAMENT (GENEVA), FEBRUARY 10, 1983

INTRODUCTION

This paper presents current U.S. views on the contents of a chemical weapons convention. It is subject to further modification and refinement.

I. SCOPE OF PROHIBITION

Basic prohibition

The Convention should require a party: (a) never to develop, produce, otherwise acquire, stockpile, retain, or transfer chemical weapons; (b) to eliminate existing stockpiles of chemical weapons; (c) to eliminate facilities for production or filling of chemical weapons; (d) not to conduct activities directly related to use of chemical weapons (For example, not to practice employment of chemical weapons. Protective activities would be unaffected.); (e) not to use chemical weapons in any circumstances where use is not already prohibited by the 1925 Geneva Protocol. (According to the terms of the Protocol, its provisions apply, for example, only in "war" and only between Parties).

The provisions of the Convention should cover super-toxic lethal, other lethal, other harmful chemicals (such as incapacitating chemicals), and their precursor chemicals, but not riot-control agents or herbicides. Toxins would be included implicitly since they are toxic chemicals.

Nontransfer/nonassistance

The Convention should prohibit:

(a) transfer to anyone, directly or indirectly, of any chemical weapons;

(b) transfer to anyone, directly or indirectly, other than another party, of any super-toxic lethal chemical or key precursor produced or otherwise acquired for protective purposes. Transfers would be limited to a maximum of 100 grams in any twelve-month period. Advance notification of the Depositary (as specified in an annex) of any transfers of such a super-toxic lethal chemical or key precursor should be required;

(c) assisting, encouraging, or inducing, directly or indirectly, anyone to engage in activities prohibited to a party under the convention.

Terminology

Key terms used in the Convention should be carefully defined to ensure that the Convention's provisions are clear and precise. Important terms that need to be defined, and the United States understanding of them, are given below:

The term "chemical weapons" should be used to mean:

(a) Super-toxic lethal, other lethal, and other harmful chemicals, and their precursor chemicals, regardless of the method of production, except for those intended for permitted purposes as long as the types and quantities involved are consistent with such purposes; or

(b) munitions or devices specifically designed to cause death or other harm through the toxic properties of chemicals released as a result of the employment of such munitions and devices; or

(c) any equipment or chemical specifically designed for use directly in connection with the employment of such munitions or devices.

The term "super-toxic lethal chemical" should be applied to any toxic chemical with a median lethal dose which is less than or equal to 0.5 mg/kg (subcutaneous administration) or 2,000 mg-min/m^3 (by inhalation), when measured by an agreed method. (This category is intended to include nerve gas and mustard gas, but not such agents as hydrogen cyanide);

The term "other lethal chemical" should mean any toxic chemical with a median lethal dose which is greater than 0.5 mg/kg (subcutaneous administration) or 2,000 mg-min/m^3 (by inhalation) and which is less than or equal to 10 mg/kg (subcutaneous administration) or 20,000 mg-min/m^3 (by inhalation), when measured by an agreed method;

The term "other harmful chemical" should be applied to any toxic chemical with a median lethal dose which is greater than 10 mg/kg (subcutaneous administration) or 20,000 mg-min/m^3 (by inhalation), when measured by an agreed method;

The term "precursor chemical" should be applied to any chemical which may be used in production of a super-toxic lethal chemical, other lethal chemical, or other hramful chemical;

The term "key precursor" should be applied to any precursor chemical which, based on agreed guidelines, is agreed to be of particular importance;

The term "nonhostile purposes" should cover industrial, agricultural, research, medical or other peaceful purposes, law-enforcement purposes, or protective purposes;

The term "permitted purposes" should cover non-hostile purposes and military purposes which are not dependent on the toxic properties of chemicals;

The term "protective purposes" should cover purposes directly related to protection against chemical weapons;

The term "chemical weapons production or filling facility" should be used for any building or any equipment which in any degree was designed, constructed or used since (blank) for production of any chemical, including key precursors, primarily useful for chemical weapons, or designed, constructed or used since (blank) for filling chemical weapons.

Permitted activities

Each country should be allowed to retain, produce, acquire, or use any toxic chemical, and its precursor chemicals, for permitted purposes, of types and in quantities consistent with such purposes. The aggregate quantity of super-toxic

lethal chemicals and their key precursors produced, diverted from chemical weapons stocks, or otherwise acquired, or on hand at any one time for protective purposes, should be as low as possible and should not exceed one metric ton for any party.

Any party which produces super-toxic lethal chemicals for protective purposes should be required to carry out the production at a single specialized facility, the capacity of which should not exceed an agreed limit.

Each party should be required to make an annual declaration regarding all toxic chemicals which are useful for chemical weapons but are devoted to protective activities.

II. DECLARATION/DESTRUCTION

Shortly after a state becomes a party certain key information regarding its chemical weapons capability should be provided, as outlined below. Other declarations relating to required or permitted activities would be made subsequently. Detailed requirements for the contents of all declarations should be specified in annexes.

Initial declaration

The Convention should require a declaration from each party, within thirty days after the Convention enters into force for it, regarding the following:

(a) whether or not any chemical weapons, or any chemical weapons production or filling facility, are under its jurisdiction or control;

(b) the presence on its territory of stocks of chemical weapons and/or of chemical weapons production or filling facilities, which are under the jurisdiction or control of anyone else, and the locations of such stocks and facilities;

(c) the location of any chemical weapons stocks which are under its jurisdiction or control and the detailed composition of the stocks at each location; (Chemicals should be declared by scientific chemical name, toxicity and weight. The fraction in munitions/devices should be given. Munitions/devices should be declared by type and quantity. "Specifically-designed" equipment should be declared by type and quantity.);

(d) its plans for destruction of any stocks under its jurisdiction or control;

(e) the location, nature, and capacity of any chemical weapons production and filling facility which has been under its jurisdiction or control at any time since (blank). (Such facilities should be declared even if they were or are dual-purpose facilities designed or used in part for civilian production, have been destroyed, or are now being used for other purposes. The declaration should also specify the chemical name of any chemical ever produced at the facility, including civilian products, if any.);

(f) its plans for closing and eventually destroying any chemical weapons production or filling facilities under its jurisdiction or control;

(g) the location and capacity of the small-scale production facility, if any, for super-toxic lethal chemicals for protective purposes;

(h) the location and nature of any other facility designed, constructed or used, since (blank) for the production of certain commercial chemicals deemed by the Consultative Committee to pose a particular risk (such as key precursors or chemicals closely related to them);

(i) the location and nature of any facility under its jurisdiction or control designed, constructed, or used since (blank) for development of chemical weapons. (This would include test and evaluation sites.)

Locations should be specified with sufficient precision to permit unambiguous identification of sites and facilities.

Other declarations

Each Party should be obligated to provide information (as specified in an annex) regarding the production and use of key precursors and other specific commercial chemicals deemed to pose a particular risk.

Elimination of stocks

The Convention should require that any party having chemical weapons stocks under its jurisdiction or control must:

(a) permit systematic international on-site inspection of its stocks promptly after declaration, on an agreed basis;

(b) eliminate these chemical weapons by destroying them;

(c) begin the elimination process not later than six months after the Convention enters into force for it and complete the process not later than ten years after that date;

(d) carry out, according to an agreed schedule, the elimination process, employing agreed procedures which permit systematic international on-site verification;

(e) permit systematic international on-site verification of the destruction process on a continuous basic until destruction is completed; (Both inspectors and sensors should be utilized.)

(f) Notify the Depositary annually regarding implementation of its plan for elimination of chemical weapons stocks;

(g) Certify to the Depositary that its stocks have been eliminated, not later than thirty days after the elimination process has been completed.

Provisions for chemical weapons found after the initial declaration has been made

Experience has shown that small quantities of chemical weapons may from time to time be found. The provisions of the Convention must take into account that such discoveries may occur after the initial declaration has been made. Care must also be taken to ensure that an opportunity for evasion is not created.

The Convention should require any party which discovers any chemical weapons anywhere under its jurisdiction or control which have not been declared to:

(a) Notify the Depositary within thirty days of the discovery of the approximate quantity and type of the chemical weapons found. The notification should also specify how, where, and when the chemical weapons were found, why they were previously unknown, and where they are being stored;

(b) Notify the Depositary within ninety days of the discovery of the exact quantity and type of the chemical weapons found, including the scientific chemical name and formula of any toxic chemical found and its quantity. The notification should specify plans for destruction of the chemical weapons.

The chemical weapons found should be subject to:

(a) prompt and systematic international on-site inspection;

(b) internationally-monitored storage;

(c) destruction within one year if found more than nine years after the Convention entered into force for the party;

(d) systematic international on-site inspection of destruction.

Closure and destruction of facilities

The Convention should require each party to:

(a) cease immediately all activity, except that required for closure, at any chemical weapons production or filling facility;

(b) close each facility according to agreed procedures which would render the facility inoperative;

(c) permit systematic international on-site inspection of each such facility promptly after declaration, and subsequently at agreed intervals until the facility is destroyed;

(d) permit monitoring of each facility by appropriate types of sensors installed at the facility;

(e) destroy each facility by razing it, employing agreed procedures which permit systematic international on-site verification and according to an agreed schedule;

(f) begin destruction of its chemical weapons production and filling facilities not later than 6 months after the date on which the Convention entered into force for it and complete it not later than ten years after that date;

(g) permit systematic international on-site verification of the destruction of such facilities, at an agreed level until the facilities are destroyed;

(h) undertake not to construct any new facilities, or modify any existing facilities, for purposes proscribed by the Convention;

(i) notify the Depositary annually regarding implementation of its plan for destruction of facilities;

(j) certify to the Depositary that its facilities have been destroyed, not later than 30 days after the destruction process has been completed.

A chemical weapons production or filling facility could be temporarily converted for destruction of chemical weapons. The converted facility would have to be destroyed as soon as it was no longer in use for destruction of stocks and not later than 10 years after the date on which the Convention entered into force for the party.

III. VERIFICATION AND ASSURANCE

Consultative committee

The Convention should provide for establishment of a Consultative Committee. The Committee should hold its first meeeting within one month after entry into

force of the Convention. Each party should be allowed to designate a representative to the Consultative Committee.

The Consultative Committee should:

(a) Develop, and revise as necessary, detailed provisions for exchange of information, declarations, and technical matters related to implementation of the Convention;

(b) Review new scientific and technical developments which could affect the operation of the Convention;

(c) Provide a forum for timely and responsive discussion of questions regarding compliance;

(d) Conduct (as specified in annexes) systematic on-site inspection of:

(1) declared stockpiles, on an agreed basis;

(2) destruction of declared stocks, on a continuous basis until destruction is completed;

(3) closure and destruction of declared production and filling facilities, at an agreed level until the facilities are destroyed;

(4) permitted small-scale production and facilities for super-toxic lethal chemicals for protective purposes, at an agreed level for as long as a facility is maintained for this purpose;

(5) production for permitted purposes, of specified types of chemicals which are deemed to pose a particular risk, on a random basis and at an agreed level.

Such systematic international on-site inspections would be agreed to in advance in the Convention and thus would be mandatory in nature.

(e) Conduct ad hoc on-site inspections for fact-finding purposes;

(f) Participate in ad hoc on-site inspection for fact-finding purposes agreed between two or more parties, if requested to do so by one of the parties involved.

All on-site inspections, both systematic and ad hoc, should be carried out according to procedures agreed in advance. An annex to the convention should specify the objectives for inspections, contain guidelines for inspection procedures, and specify the rights and functions of inspectors and of host state personnel.

The Consultative Committee should not take any decisions as to whether or not a party is in compliance with the provisions of the Convention.

The Consultative Committee should be organized, and should function, as specified in an annex. The full Committee should meet at agreed intervals.

To assist in carrying out the activities of the Consultative Committee, a Committee Secretariat should be established. The overall composition of the Secretariat should be generally consistent with the composition of the Consultative Committee. The Committee may, for specific tasks, set up other subordinate bodies which may continue their work between meetings of the Committee.

For the purpose of providing confidence in compliance, each party should be obligated:

(a) To cooperate fully with the Consultative Committee in the exercise of its verification responsibilities;

(b) Not to interfere, through deliberate concealment measures or in any other manner, with the conduct of verification activities. This should apply to activities conducted by the designated representatives of the Consultative Committee or by parties, including those using national technical means at their disposal in a manner consistent with generally recognized principles of international law.

The Consultative Committee should present an annual report on its activities to the States Parties.

Provisions should be included for meeting the expenses of the Committee.

Preparatory commission

In order to facilitate prompt implementation of the provisions of the Convention after entry into force, an annex to the Convention should provide that a Preparatory Commission would come into existence soon after the Convention is opened for signature. Further views concerning the Preparatory Commission are outlined in Appendix I to this paper.

Consultation and cooperation; resolving compliance issues

The Convention should contain an undertaking by countries to consult one another and to cooperate in solving any problems which may be raised in relation to the objectives of, or in the application of the provisions of, the convention.

Parties should agree to provide in a timely manner, bilaterally or multilaterally, information to assure confidence in its compliance with the obligations assumed. Such provision of information could be accomplished by, but should not be

limited to, inspection of the areas of concern, carried out in accordance with agreed procedures.

Consultation and cooperation might in addition be undertaken through appropriate international procedures within the framework of the United Nations and in accordance with its Charter. These international procedures would include the services of appropriate international organizations, as well as the Consultative Committee and its subordinate bodies.

The Convention should establish a sequential process for resolving compliance issues, beginning, if possible, with discussions among the parties directly involved. If initial bilateral efforts were not possible or were unsuccessful, the issue could be discussed by a subordinate body of the Consultative Committee, by the Committee itself, and by the appropriate U.N. body. (Further detail on this process is given below.)

Any party which has reason to believe that any other party may not be in compliance with the provisions of the treaty, or which has concerns about a related situation that may be considered ambiguous, should be entitled to request clarification of the actual state of affairs bilaterally or through the Consultative Committee. Such a request, which may include a request for an ad hoc on-site inspection, should be accompanied by a explanation. (A party should not be expected to present conclusive evidence, but only its reasons for concern. Also, any bilateral action taken under this procedure should not preclude recourse to multilateral action by a party.)

The Depositary should be obligated to convene, as soon as possible and in any case within ten days, upon request by any party, the fact-finding panel of the Consultative Committee (outlined in Appendix II). The panel should promptly conduct a fact-finding inquiry, including any ad hoc on-site inspections considered necessary by at least five members of the panel, and transmit to the Depositary a report on its work, whether interim or final, within six months of the date of the convening of the panel. Reports of the panel should include all views and information presented to the panel during its proceedings. The Depositary should distribute the report to all parties.

Any party whose concerns about compliance have not been resolved by the fact-finding panel within six months should be able to request the Depositary to convene a special meeting of the Consultative Committee to consider a compliance issue. The Depositary should convene such a meeting as soon as possible and in any case within one month of the receipt of the request. Any party should be able to participate in such a meeting, whose functions and rules of procedures should be established in an annex.

Each party receiving a request for an ad hoc on-site inspection from the fact-finding panel or the Consultative Committee should have a stringent obligation to permit the inspection. If a party refuses such a request, the Depositary should promptly notify the Security Council.

The complaint provisions should not be interpreted as affecting the rights and duties of parties under international law, particularly as regards bringing to the attention of the Security Council concerns about compliance with the Convention.

Since questions arising about use of chemical weapons would also raise questions about compliance with the Convention's ban on production and stockpiling of chemical weapons, the fact-finding procedures should enable reports of chemical weapons use to be investigated. Evidence of use should constitute evidence of violation of the Convention.

Domestic implementation measures

Each party should: (a) take any measures necessary in accordance with its constitutional processes to implement the Convention, and in particular to prohibit and prevent any activity in violation of the Convention anywhere under its jurisdiction on control, and (b) inform the Consultative Committee of the legislative and administrative measures it had taken to implement the Convention.

Confidence-building measures

Further legally binding measures should be developed specifically for the purpose of building confidence in compliance.

Efforts should be made to identify, and place limitations on, any specific protective equipment and activities which are particularly valuable for use of chemical weapons. For confidence-building purposes, information should be provided on activities related to protection against chemical weapons.

Confidence in the declaration of stocks is particularly important for confidence in the effectiveness of the treaty regime as a whole. Additional measures should

be developed which will promote, at the earliest possible stage, confidence in the stockpile declaration.

Until the destruction process has been completed, the existence of chemical weapons stocks poses a risk that these chemical weapons may be used in a surprise attack. Confidence-building measures should be devised to provide confirmation that chemical weapons have not been moved from declared storage sites and that any effort to do so would be detected promptly.

IV. OTHER PROVISIONS

Withdrawal

The Convention should contain a withdrawal provision along the lines of those in previous arms control agreements.

Entry into force

To be effective and durable, a future Convention on the prohibition of chemical weapons should be adhered to by as many states as possible. The United States hopes that all States would deem it to be in their interest to join in the Convention. The United States can support an approach under which the Convention would enter into force on ratification by a suitable number of states.

Additional provision

The Convention should also contain a preamble and provisions regarding:

(a) International cooperation in the field of chemistry;
(b) the relationship with other treaties;
(c) amendment;
(d) review conferences;
(e) duration;
(f) signature, ratification and accession;
(g) languages and distribution.

Annexes

The annexes to the Convention should be considered an integral part of the Convention.

APPENDIX I. PREPARATORY COMMISSION

The Commission should include one representative from each signatory. The Preparatory Commission should remain in existence until the Convention comes into force and thereafter until the first meeting of the Consultative Committee. Its actions must be consistent with the principles and objectives of the Convention.

Specific provisions should be made for meeting the expenses of the Preparatory Commission.

The Preparatory Commission should:

(a) elect its own officers, adopt its own rules of procedure, meet as often as necessary, determine its own place of meeting and establish such committees as it deems necessary;

(b) appoint an executive secretary and staff, who should exercise powers and perform such duties as the Commission determines;

(c) make arrangements for the first session of the Consultative Committee, including preparing a provisional agenda, drafting rules of procedure, and choosing the site;

(d) make studies, reports and recommendations for the consideration of the Consultative Committee at its first meeting on procedural matters of concern to the Committee which would require immediate attention, including:

(1) financing of the activities for which the Committee is responsible;
(2) the programs and budget for the first year of the Committee's activities;
(3) technical problems relevant to advance planning of Committee activities;
(4) staffing of the Secretariat;
(5) the location of the permanent offices of the Committee.

The Preparatory Commission should submit a comprehensive report on its activities to the Consultative Committee at the Committee's first session.

APPENDIX II. FACT-FINDING PANEL

The Convention should contain an annex with provisions along the lines outlined below.

Within 30 days after entry into force of the Convention the Depositary should establish a fact-finding panel. The panel should undertake to conduct a prompt

fact-finding inquiry, including any necessary ad hoc on-site inspections, to make appropriate findings of fact, and to provide expert views, on any problem referred to it by the Depositary upon request by a party.

The fact-finding panel should be composed of not more than fifteen members representing parties:

(a) Ten members should be appointed by the Depositary after consultation with parties. In selecting these members due regard should be given to ensuring an appropriate geographic balance. Members should be named for a 2-year period, with five members being replaced each year;

(b) In addition, those permanent members of the Security Council who are parties to the Convention should also be represented on the fact-finding panel;

(c) Each member could be assisted at meetings by one or more technical or other advisers.

The Depositary or his representative should serve as Chairman of the panel, unless the panel decides otherwise. The work of the fact-finding panel should be organized in such a way as to permit it to perform its functions. At the first meeting of the panel, to be held not later than 60 days after entry into force of the Convention, the Depositary should submit recommendations, based on consultations with parties and signatories, as to the organization of the work of the panel, including any necessary technical resources. The panel should decide procedural questions relative to the organization of its work, where possible by consensus but otherwise by a majority of those present and voting. There should be no voting on matters of substance.

Each member should have the right, through the chairman, to request from parties and from international organizations such information and assistance as the member considers desirable for the accomplishment of the work of the panel.

APPENDIX III. SPECIAL MEETING OF THE CONSULTATIVE COMMITTEE

The Convention should contain an annex with provisions along the lines outlined below. The special meeting of the Consultative Committee provided for in the Convention should undertake to solve any problem which may be raised by the parties requesting the meeting. For this purpose, the assembled parties should be entitled to request and receive any information which a party is in a position to communicate.

The work of the special meeting should be organized in such a way as to permit it to perform the functions set forth above. The assembled parties should decide procedural questions relative to the organization of their work, where possible by consensus, but otherwise by a majority of those present and voting. There should be no voting on findings of fact.

Any party should be able to participate in the meeting. The meeting should be chaired by the Depositary or his representative.

Each party should have the right, through the chairman, to request from States and from international organizations such information and assistance as the party considers desirable for the accomplishment of the work of the meeting.

A summary of the meeting, incorporating all views and information presented during the meeting, should be prepared. The Depositary should distribute the summary to all parties.

The CHAIRMAN. To what extent do you believe that the outcome of the U.N. investigation was influenced by the fact that it was carried out under the direction of the Political and Security Council Affairs Committee—a committee chaired by a Soviet national, U.N. Under Secretary-General Ustinov?

Secretary EAGLEBURGER. I think it almost certainly had some effect and it probably complicated the work of the experts substantially. But I think it is important to note as well, Mr. Chairman, that the investigation itself was conducted under the direction of the U.N. Center for Disarmament, which is headed by a Swedish national who has been very impartial and cooperative on the issue.

It was the Center, which comes under the supervision of the Soviet Under Secretary-General, and this situation has now been changed

because the Center has been moved from the supervision of Mr. Ustinov, and the man who heads it has been himself named an Under Secretary-General now. I think he will now be reporting directly to the Secretary-General and that that situation is substantially improved.

The CHAIRMAN. How successful have been the efforts of the U.N. Secretary-General to provide further investigative teams with access to adequate laboratory and investigative support? What provisions would the United States like to see implemented to insure effective investigations in the future?

Secretary EAGLEBURGER. It is hard at this point, Mr. Chairman, to give a very specific answer to the question. The resolution which called for the appointment of the experts was not passed until December. The Secretary-General is now in the process of picking the experts themselves and it is too early at this point to say exactly how that will work.

I can say that the United States is studying the sorts of arrangements we would like to suggest to the group. Those arrangements will, we think, largely be based on our own experiences in the investigation of the charges in Afghanistan, Laos, and Kampuchea. I think we will be suggesting to the group that they should take over some of these techniques.

We will be making recommendations fairly soon. At this point they are not totally worked out, but I would be more than happy, as we move toward deciding what we would like to suggest to the expert group, that we keep this committee informed and discuss it with you a little bit later.

The CHAIRMAN. To what extent do you attribute the hesitancy of many third world nations in accepting the evidence of Soviet use of toxic agents and their relative lack of enthusiasm for a chemical disarmament agreement, particularly given their distinct vulnerability to such weapons?

Secretary EAGLEBURGER. Mr. Chairman, I am not sure that I would accept the major premise—that these third world countries have been hesitant. Well, they may have been in the past, I think to some degree, because they were concerned that this was a United States-Soviet issue and perhaps one in which they ought not be directly engaged.

But, as I indicated earlier, I think that attitude has changed substantially. These people are, as I said, the object of the attacks—the toxin and chemical attacks themselves. I think we are seeing a fairly substantial shift in the attitudes of the third world toward this question, again, as we are seeing now in Geneva with their reaction to our proposals that we have put on the table there recently. So I think that attitude, that sense of concern over that issue has changed substantially in the last few months.

The CHAIRMAN. I wonder if you could update me on the anthrax situation that occurred—the breakout in the Sverdlovsk region of the Soviet Union—where evidence seemed to be rather strong that they had gone beyond their treaty limitations of research and development and actually might be in production?

Under the provisions of our treaty with the Soviets, there are steps that need to be taken and can be taken in accordance with that treaty

to thoroughly investigate it and determine the facts. We have made a demarche to the Soviet Union. I have not heard back since then.

What progress, if any, has occurred?

Secretary EAGLEBURGER. I regret to say that I cannot report any progress. We have raised the issue with the Soviets in this administration a number of times, to their great irritation, but they have not been responsive at all. We continue to investigate the evidence. We have seen absolutely nothing that would change our view that in fact the evidence is very strong that there has been a violation of the treaty.

The one fact, for example, is that there was this outbreak of pulmonary anthrax in the area where we suspected that the plant was located, and the Soviet explanation that this came from contaminated meat is scientifically impossible because you do not get pulmonary anthrax that way.

I think it is evidence that the treaty lacks the teeth needed, both in terms of verification and in terms of assuring compliance. Those are issues which we intend to try to correct over the coming months. We will again, I suspect, have substantial difficulties with the Soviets in pushing them in this direction, but we are going to try.

But I can, unfortunately, offer no indications whatsoever that the Soviets have changed their totally uncooperative attitude of earlier months.

The CHAIRMAN. One final question. In 1981 in Berlin Secretary Haig, you recall, spoke of a double standard of international opinion in judging the United States versus Soviet behavior. Do you believe that such a double standard does exist and, if so, to what do you attribute this condition?

Secretary EAGLEBURGER. Since I had something to do with the writing of that in the speech, Mr. Chairman, I did have something to do with it.

The CHAIRMAN. I suspected you did.

Secretary EAGLEBURGER. It is a frustrating subject, and one which I tend to get excited about on occasion. I think there is no question there is a double standard. I suppose that, at least in one sense, we have to take pride in that fact. I think it indicates that the standards which others expect of us are substantially higher than those of the Soviet Union, and, therefore, we tend to be judged by a higher standard than are the Soviets.

And in that sense I think it is a good thing, I suppose. But, you know, one of the important purposes to this hearing, it seems to me, is to remind the world and, indeed, the American people that these activities are going on on the part of the Soviets, that they are killing people in Afghanistan, Laos, and Kampuchea with chemical and toxin weapons, that these acts are in violation of international agreements, and that the civilized world ought not accept that conduct.

We tend, I think, to see a world that gets nowhere near as excited about this subject as it does the endless debate on nuclear weapons, and I think there is evidence here of a double standard. Let me give you, if I may, Mr. Chairman, an example that is outside the context of this particular issue, but that drives me crazy.

We have over the course of the last year, seen a great deal of Western press comment when we have, on occasion, talked about the pos-

sibility of the thought at one time within the alliance of perhaps a demonstration nuclear explosion in the North Sea. You will recall we had a great debate about that in the press for months.

On the other hand, the Soviet Union, shortly after Prime Minister Nakasoni returned from his visit to Washington, the Soviet Union in effect threatened Japan with nuclear devastation, and I do not recall having seen anybody's front page talk about that at all.

It is a double standard, which is something we have to live with.

The CHAIRMAN. Secretary Eagleburger, I want to thank you very much for your testimony. We appreciate your being here. If you would be willing to answer any questions that are submitted for the record by absent Senators, we would appreciate it.

Secretary EAGLEBURGER. Certainly, Mr. Chairman.

The CHAIRMAN. Thank you. The Chair will call now Dr. Amos Townsend, Sterling Seagrave, Rear Adm. Thomas Davies, and Ambassador James Leonard.

Gentlemen, the committee welcomes you. Senator Pressler is now on his way back, I am told. Regretfully, my own meetings have terminal points on the ends of them, so I will have to leave at this moment, but I will keep in touch to make certain that he has come back.

So if we would just stand in recess for a few minutes until Senator Pressler can pick it up again, I thank you and I apologize very much to you for the inconvenience.

[Recess.]

Senator PRESSLER [presiding]. Again my apologies for the difficulty of the day. I wish now to give my opening statement and then will call on these witnesses. Senator Percy has departed, but other Senators may come back.

Today the Subcommittee on Arms Control has been receiving testimony on the Soviet Union's use and/or provision of chemical warfare agents in Southeast Asia and Afghanistan and its implications for arms control.

This is the second hearing that I have chaired on "yellow rain," the name given to this illegal and inhumane substance by its victims. The first hearing, which examined some of the early evidence, suggested that the Kremlin is engaged in this contemptible behavior, occurred in 1981. At that time, opinion on the issue was somehwat divided. In the past 1½ years, the situation has changed.

The U.S. administration has come forward with two compilations of evidence and has gathered physical proof of the continuing atrocities. The administration reports are compelling. Let me note that these charges did not originate with this administration: The allegations were first presented to the United Nations by the Carter administration.

In recent months, the Canadian Government has issued its own reports, which conclude that chemical warfare is occurring. The United Nations, despite the repeated interference of a Soviet-appointed senior official, has produced a preliminary report which provides additional support for these charges. I have asked that a Science magazine article which summarizes these investigations be printed in the record at the conclusion of my remarks, together with an article from the Wall Street Journal which takes a critical look at the U.N. investigation.

There can be few doubts left in the minds of most experts that the Soviets are using chemical warfare in Afghanistan and they are providing such agents to the Vietnamese. The victims of this warfare are often women and children and peasants. Chemical weapons do not discriminate between soldiers and noncombatants. But in a sense we are all victims of these atrocities.

In using these weapons, the Soviet Union is acting in flagrant violation of arms control agreements to which it and other nations are signatories. By acting as they have, the Soviets have reduced the prospects for significant arms control agreements. If we are to avoid nuclear destruction, we must have such agreements.

It is deplorable to find that many of those who urge a rapid movement in arms control are silent on these treaty violations. If arms control is to be of value, those who break treaties, at a minimum, must suffer the condemnation of international opinion. This situation is changing, as is evident in the Canadian and United Nations reports.

There are important lessons to be gained from these incidents which have a direct bearing on arms control and on United States-Soviet relations in general. For this reason, I have scheduled this second hearing on "yellow rain." At the outset, let me note several important lessons that I draw from this situation.

First, arms control agreements reached for agreement's sake are of little value to any nation and such accords are likely to undermine the prospects for serious arms control. This problem is especially likely to occur with agreements that lack sufficiently strong verification arrangements, as is true of the treaties that prohibit chemical and biochemical warfare.

Second, we should not delude ourselves in regard to our negotiating partner. The Soviet Union does not share our values. Soviet rule is often based upon a notion that might makes right. This is evident in the story of yellow rain, as it is evident in Moscow's occupation of Afghanistan and in interference in Eastern Europe.

Having said that, I continue to believe that arms control is and must be at the very top of the U.S. security agenda. Because the Soviet Union is a nation that operates outside of our system, we need to negotiate arms restraints and reductions with Moscow. Of course, such agreements must have sound arrangements to assure compliance.

Were the Soviet Union a friendly power, there would be no need for arms control. The weapons of our friends and allies do not threaten us. For instance, we need no arms control agreements with either France or Britain, though both have nuclear weapons and have the capacity to manufacture chemical and biological weapons.

[The articles referred to follow:]

[From Science, Dec. 17, 1982]

A Cloudburst of Yellow Rain Reports

(By Eliot Marshall)

U.N. and Canadian investigators agree that chemical weapons are being used, but fail to endorse the U.S. discovery of mycotoxins

Two State Department officials lifted a large box onto the dais during a news conference on 29 November, pulled off a cardboard sheath, and revealed the most photogenic evidence produced so far in the investigation of chemical war-

fare in Asia. It was a Soviet gas mask, allegedly retrieved by a covert agent in Afghanistan in September 1981. The headpiece is apparently still contaminated with the fungal toxin T2, the suspected active ingredient in yellow rain.

The cameras clicked. The reporters murmured. And an official said no one need be afraid because the mask was sealed in an airtight container. One reporter gibed at the speaker. Robert Dean, deputy director of the Bureau of Politico-Military Affairs: "Why don't you slip it on for us Bob?"

So went the latest and most disturbing briefing in America's effort to persuade the world that the Soviets are using outlawed chemical weapons in Southeast Asia and Afghanistan. It preceded by one week the release of a less dramatic United Nations (U.N.) report, the product of 2 years of research, titled, "Chemical and Bacteriological (Biological) Weapons Report of the Secretary General." The U.N. investigators found two charges to be "well supported." These were claims by refugees that "harassing agents" were used against resistance fighters in Afghanistan and that "some toxic material" was used against the Hmong people of Laos. The U.N. team found no proof that fungal poisons (mycotoxins) were involved. But it also rejected a Soviet thesis (*Science*, 2 July, p. 32) that mycotoxins spread through Southeast Asia after the United States seeded the area with elephant grass.

American officials expected the U.N. report to be equivocal, and they took pains to lay out their own strongest evidence a week in advance. Dean told the reporters that "all the relevant government agencies" are now convinced that the Soviets and their allies are engaged in chemical warfare. The government claims to have "conclusive evidence" that compounds forbidden by the 1925 Geneva Protocol and by the 1972 Biological and Toxin Weapons Convention—including the tricothecene toxin T2—are being used in Laos. Kampuchea, and Afghanistan. The Soviet Union signed the 1972 treaty, which forbids not just the use, but the possession of biological weapons. The latest attacks occurred as recently as October in Laos and Kampuchea, Dean said. The State Department called the press conference to display the gas mask, one of two recovered from Afghanistan, and to release a new report[1] to Congress and the U.N.

The bulk of the 12-page report lays out new and old evidence collected by U.S. intelligence agencies, including some findings produced by the analysis of blood, urine, and tissue samples taken from victims of gas attacks in Laos and Kampuchea. (The gas masks are the only physical evidence of chemical warfare in Afghanistan; given their origin, it is impossible to check on their *bona fides*.) Biological samples from 33 alleged victims in Southeast Asia have been screened, according to the report. "Specimens from 16 of these individuals show the presence of tricothecene mycotoxins." T2 and other tricothecene toxins have been found together in environmental samples collected at battle sites, apparently in combinations never seen in nature. Canadian and U.S. experts have concluded independently that these deposits could not have occurred naturally. The report says, "The finding of T2 toxin and HT2 toxin . . . in the blood, urine, and tissue of victims of these attacks provides unequivocal evidence of their use as weapons."

The Soviet response, issued by *Tass* the next day, was that all of this is a "brazen lie" and "a propaganda screen behind which the Reagan Administration is pressing forward its large-scale program of preparations for chemical and bacteriological warfare."

With the superpowers engaged in a verbal brawl such as this, it is all the more important that disinterested experts intervene. The credibility of the U.N. and of the general effort to control weaponry hangs in the balance.

There are signs that the U.N. may be ready to become more actively involved than it has been. The recent investigation was hampered by inadequate laboratory facilities, staff turnover, and poor data collection. On 26 November, the General Assembly voted 106 to 14 to call a special conference "as soon as possible" to review the 1972 toxin treaty and to design a new system for investigating complaints and checking on compliance. On 29 November, the General Assembly voted 71 to 18 to ask the director general of the U.N. to give chemical and biological warfare questions more visibility in the bureaucracy. In the past, such matters have been passed down to the disarmament staff. Now the director general has been asked to draw up a standing list of laboratories and experts competent to study these charges and to appoint a new investigative group responsible directly to him. Among the nations opposing both resolutions were Afghanistan, Laos, Vietnam, and the Soviet Union.

[1] "Chemical Warfare in Southeast Asia and Afghanistan: An Update," Special Report No. 104, U.S. Department of State, Washington, D.C., November 1982.

The only other relevant investigation[2] was conducted last spring by several Canadian officials led by Lieutenant Colonel G. R. Humphreys of the military surgeon general's office in Ottawa. With another officer and some diplomatic officials, he spent a month interviewing victims of gas attacks in refugee camps and hospitals along Thailand's border with Laos and Kampuchea. The Canadians also collected samples, but the analysis may not be available for some time, because, a laboratory officials say: "We don't want any mistakes."

Based on interviews and a reading of medical records, the Canadians concluded that chemical or biological agents are being used against unprotected troops and civilians in Southeast Asia. At least two different materials are involved. Humpheys says. One of them may contain mycotoxins. The other is a "knockout" agent. The Canadians saw and collected samples of yellow rain themselves, and Humphreys can testify to its devastating effects on Hmong villagers.

The Canadian report differs from the State Department's in two important respects. First, the Canadians found the American description of yellow rain poisoning to be exaggerated. Rather than producing immediate vomiting, hemorrhaging, and death, as claimed by the Americans, yellow rain was slow to produce effects and they seemed reversible, according to Humphreys. Those who died were chiefly the very young and very old who, in the absence of good medical care, became dehydrated by 10 or more days of vomiting and diarrhea. The Canadian description is compatible with the observed effects of tricothecene poisoning in laboratory animals.

Second, the Canadians concluded that a closely analyzed battle near Tuol Chrey, Kampuchea, exposed Khmer Rouge soldiers to a "highly potent" incapacitating agent, not yellow rain. The Canadians did not exclude the possibility that some mycotoxins were mixed with the knockout agent. This chemical did not appear lethal, Humphreys says, but did put soldiers out of action for several days. Humphreys is unequivocal: the substance used against the Khmer Rouge soldiers was not yellow rain but a volatile material suitable for use where friendly and hostile forces must operate in the same environment. This contrasts with the U.S. report, which stressed that the blood and urine of the Khmer Rouge victims at Tuol Chrey contained the mycotoxin T2, an alleged ingredient of yellow rain.

The State Department's November paper also emphasizes the fact that high levels of T2 were found in the stomach and intestine of a soldier who died a month after being exposed to the gas attack at Tuol Chrey. Humphreys found it "impossible to exclude blackwater fever [a variety of malaria] as a possible cause of death." Marlaria is rampant among these soldiers. Another factor confuses the case. Humphreys believes the Khmer Rouge may suffer from the misuse of atropine, a drug commonly given by Khmer Rouge medics to soldiers who have been in chemical attacks. Atropine is an antidote only for classic nerve agents. If used wrongly, as Humpherys suspects may be the case here, it can produce a variety of bad side effects. One is the retention of urine. Blackwater fever also produces kidney failure. The soldier from Tuol Chrey, according to the Canadian report, died "in acute renal failure."

Thus, while the Canadian and U.N. inquiries give strong support to the charge that toxic sprays are being used in Southeast Asia, they leave unconfirmed the charge that the poison is specifically a mycotoxin. That uncertainty may end when the Canadian laboratory finishes its analysis of the 200 or so samples collected during Humphreys' visit to Thailand. Perhaps not. It is a good sign, in any case, that other countries have begun to examine the evidence.

[From the Wall Street Journal, Dec. 14, 1982]

Is the United States Crying Wolf on Yellow Rain, or Is Everyone Else Ignoring Evidence?

(By Paul Gigot)

Bangkok, Thailand.—Diplomats here tell a joke that goes like this:

What's the best way to keep an international secret? Answer: Have the United Nations and United States investigate it. The cautious U.N. won't find the answer and no one will believe the U.S.

---

[2] "An Epidemiological Investigation of Alleged CW/BW Incidents in Southeast Asia," Directorate of Preventive Medicine, Surgeon General Branch, National Defense Headquarters, Ottawa, Canada, 11 August 1982.

Something like that appears to have happened in the search for proof that chemical warfare is being waged by communist forces in Asia. Last month the U.S. published its second detailed report in a year charging that chemicals, sometimes called yellow rain, are being used by Vietnamese forces in Laos and Cambodia, and by the Soviet Union in Afghanistan. Yet there has been little world reaction, beyond denials by the Soviets and Vietnamese. And last week a U.N. investigating team issued its second inconclusive report in as many years.

This turn of events has frustrated diplomats and people who work with refugees here, many of whom believe the U.S. has built a formidable case. The evidence includes interviews with dozens of doctors and refugees, blood and urine tests that show unusually high levels of toxins, and the testimony of defectors. No one claims to have absolute proof—the "smoking gun," say, of actual photos of a chemical attack—but most believe the charges deserve at least more thorough investigating.

LITTLE MORAL OUTCRY

"It's an incredible situation," says Marius Grinius, a Canadian diplomat here. "The U.S. has what appears to be very important evidence, yet there's been little moral outcry or even world concern."

People familiar with the issue here point to three reasons: the timidity of the U.N.; suspicions about U.S. motives, and the reluctance of independent humanitarian agencies and Third World countries to take a stand that would anger the Soviets or Vietnamese.

The U.N. team had promised to "spare no effort" to find the truth. Even critics say this year's 81-page report is an improvement over last year's because it concludes that "circumstantial evidence" exists that chemical attacks did take place. (Last year's report didn't come to any conclusion.)

But the 1982 report still finds that the charges haven't been proven. Critics say that is at least partly because the team didn't aggressively search for proof. "They tiptoed through the evidence," says Stuart J. D. Schwartzstein, director of the Chemical/Biological Weapons Information Project, affiliated with Tufts University in Medford, Mass.

Critics point out that the U.N. experts were denied entry into Laos, Cambodia and Afghanistan and that they confined their investigation in Thailand to two hurried weeks last month. One Thai military source says the U.N. group rushed so quickly to meet its year-end report deadline that it didn't even fully analyze the blood and urine samples it received from alleged victims.

The team only interviewed medical personnel and refugees who were brought to them, the critics add, and only long after any alleged attack had occurred. Nor did the team keep a member in Thailand fulltime to monitor alleged victims before the toxin in their blood disappeared.

The U.S. reports seem to have hurt as much as helped the cause. On the one hand, without the U.S. efforts the claims of refugees might have been ignored. But because the U.S. reports blame the Soviets, the issue has acquired political overtones the cast doubt on U.S. motives and make allies more reluctant to side publicly with the U.S. "It's been a political hot potato ever since it was picked up by the U.S. says Canada's Mr. Grinius.

Other foreign missions in Thailand interviewed alleged victims and collected samples. But so far only Canada has released an independent report that supports some of the U.S. charges.

Some sources cite a "Vietnam legacy" that makes any U.S. involvement in the region suspect. But others blame the U.S. State Department's own errors. For example, in September 1981, then-Secretary of State Alexander M. Haig Jr. made a premature public attack on the Soviets based on test results from only one chemical sample. Six months later the State Department issued its first detailed report but that initial flimsy impression has lingered.

STATE DEPARTMENT AMBIVALENCE

Others say the U.S. hasn't worked hard enough to enlist the support of allies, especially of Southeast Asian nations fearful of Vietnamese military power. Critics cite a curious ambivalence even with the State Department. Despite having invested so much credibility in its two reports, for example, the U.S. Embassy here still has only two staff members devoting only a third of their time to the issue. "If this is so important, then why don't they assign somebody full time?" asks one embassy source who requested anonymity.

The silence of humanitarian agencies also has hurt. Because they aren't politically aligned, these agencies have unique access to war victims, and thus could add more weight-or discount-the chemical warfare claims. Several sources in Thailand contend that the international Committee of the Red Cross, among other agencies, has found evidence of chemical attacks. But Red Cross officials here refuse even to discuss the matter, referring a reporter to a November 1981 statement that claims political neutrality and says its "delegates have not undeniably established the flagrant and massive use of chemical weapons."

The Office of the U.N. High Commission for Refugees, which coordinate refugee affairs in Thailand, also hasn't taken a stand. "I don't have an opinion," says Daniel Bellamy, the UNHCR representative at the Ban Vinai camp near Laos where many refugees complain of chemical gassing. Seated at his desk, Mr. Bellamy opens a folder marked "Gassing File" and leafs through medical reports sent to him by camp doctors. "I only read these reports," he says. "The UNHCR isn't involved in political issues."

To be sure, some agencies have quietly supplied the U.S. and U.N. with samples and testimony. But they refuse to make more public statements that might provoke world opinion to apply pressure to discover the truth-perhaps in the way pressure was applied on Israel to investigate the Beirut massacre, as one source puts it.

"I don't think (the chemical issue) is being ignored. But there is a credibility gap," says Thomas Yates, Thailand director of the International Rescue Committee. "There hasn't been a public outcry and I don't understand why."

Senator PRESSLER. I hope that our witnesses today can provide us with further insights into this important question. We have been privileged to receive testimony from Lawrence Eagleburger, Under Secretary of State for Political Affairs. Mr. Eagleburger will now be followed by two public witnesses who will testify on the evidence of "yellow rain."

First we will hear from Dr. Amos Townsend, who has spent the past 2 years looking at this deadly situation on the ground in Southeast Asia. Dr. Townsend flew in especially for this hearing and I would like to thank him for coming, and the International Rescue Committee for making Dr. Townsend available to the committee. The second witness is Sterling Seagrave, the author of the book "Yellow Rain."

The second group of public witnesses will discuss the implications of "yellow rain" for arms control. They are Rear Adm. Thomas Davies, U.S. Navy, retired, former Assistant ACDA Director; and James Leonard, former U.S. Representative to the Committee on Disarmament.

At this point I shall call on Dr. Townsend.

[Dr. Townsend's biographical data follows:]

BIOGRAPHICAL DATA OF AMOS R. TOWNSEND

Initial family: Born: April 23, 1930 of Canadian mother, Clara E. Forbes, Yarmouth, Nova Scotia, American father, Harry Storrs Townsend, Lebanon, N.H.—thus of Royalist and Revolutionary heritage.

Grew up on ancestral farm: Storr Hill, Lebanon, N.H. 03766.

Three half siblings—Howard, farmer, former Com. Agric. for N.H. 1972–82, Lebanon, N.H.; Paul, physicist, Boeing Aircraft Co. and Allen Organ Co., Everett, Wash.; Marion T. Packard, secretary, Shelburne Falls, Mass.

Immediate family: Wife: Dorée Connelly T., marriage July 11, 1954: 9 children, age 27–4 including one adopted American, and one foster Khmer orphan; 2 grandchildren.

Education: Lebanon, N.H., public schools; U of N.H. 1952—BS in Biology, Education—Minor; ROTC USAF—Commission 1952; Columbia U. School of Public Health 1954 MS (sent to study Biological Warfare by USAF); Dartmouth Medical School 1959 (2 year school only); University of Pennsylvania, School of Medicine, M.D., 1951; 1961 Internship—Andrews AFB, Md. 1962; 1962 Primary Course in Aerospace Medicine, Brooks AFB, Tx.

Work: 1954–55—Fort Detrick, Maryland, Research in Personnel Protection Equipment.

1955–57—Gunter, AFB, Ala., teaching in preventive-occupational medicine.

1962–66—Wethersfield AB, UK, Flight Surgeon for F–100–77TFS, 20 TFW, USAF.

1966–69—Staff Medical Office in Preventive and Occupational Medicine, HW USAF–SGO, Wash., D.C.

1969–70—Pleiku AB, RVN, Dispensary Commander, PACAF.

1970–71—Phu Cat AB, RVN, Hospital Commander, PACAF.

1971–72—McGuire AFB, N.J., Dispensary Commander, MAC.

1973–76—Staff Officer, Medical Standards Div. HQ USAF—SGO, Washington, D.C.

1976–79—Clinician, USAF Flight Surgeon's Clinic, Pentagon.

1979–79—FSO, Andrews AFB, Md.

December 1, 1979, Retired USAF, signed on with International Rescue Committee.

December 1979–August 1980, Medical Coordinator, IRC, Thailand.

Except 1980–March 1981, Hospital Coord., IRC, Nongkhai, Thailand.

April–June 1981, Gathering CBW information IRC, for U.S. Embassy, Bangkok.

December 1980–June 1981, Chairman, Medical Subcommittee, CCSDPT,[1] Thailand.

July–December 1981,[2] Medical Coordinator, CCSDPT (for all 45 + volags in Thailand).

January 1982 to present, IRC, Investigator Consultant in CBW on loan to U.S. Embassy, Bangkok, Thailand.

STATEMENT OF DR. AMOS R. TOWNSEND, INTERNATIONAL RESCUE COMMITTEE, BANGKOK, THAILAND

Dr. TOWNSEND. Yes, sir. Mr. Chairman, in view of the time schedule, if you would prefer, I can summarize my opening statement and also, with your permission, I would like to read a brief statement which was handed to me by some Hmong leadership in the Ban Vinai camp that I was asked to bring to this meeting.

Mr. Chairman and Honorable Members of the U.S. Senate Committee on Foreign Relations, we, the Hmong people of Ban Vinai Refugee camp, wish to express our gratitude to the Committee for their concern on the issue of chemical weapons used in our homeland of Laos, as well as in Kampuchea and Afghanistan.

Surely we speak for the tens of thousands of Hmong people now living in distant lands and for those who remain in Laos when we urge you not to abandon efforts to seek the truth in this matter.

On two occasions, the United Nations has conducted investigations into chemical warfare allegations in Laos. The first was "inconclusive"; the second "cannot ignore the circumstantial evidence." It is our hope that the U.S. Government continue to remind the United Nations of the necessity of further investigation until such time as all the facts are known.

We also respectfully request that you support specialized medical treatment for those victims of chemical attacks who continue at present to arrive in Thailand. Now the dry season is here and each week there are new victims of chemical exposure arriving in Thailand. In the past month, several recently-exposed families have been hospitalized upon reaching this camp after fleeing chemical attacks in Laos. Those victims who survive and those who have died are not only those who fight in the resistance, but families with children as well.

[1] CCSDPT—Committee for the Coordination of Services to Displaced Persons in Thailand—a loose self governing body of voluntary agencies (volags) working on behalf of refugees in Thailand.

[2] While in this capacity and with the blessing of my Swedish boss, I obtained further specimens and interviews of Lao-H'Mong origin and made my initial visit to Kampuchea to interview and examine alleged Khmer victims of CBW bringing back the first blood specimens that were found positive (2 of 9) for mycotoxins at trace levels 4½ weeks post exposure. Since then positive blood, tissue and urine have been obtained from victims of Laos and Kampuchea as the State Department reports of March and November 1982 have indicated.

Now we are losing our culture and our homeland, and, most importantly, we continue to lose our people, in retribution for our alliance with the U.S. war effort in Southeast Asia.

We trust that your government will give support and assistance to the search for the facts surrounding chemical attacks on the Hmong people. We thank the Committee for allowing us to make this statement. (Signed) Mr. Vue Mai, Chairman, and Chong Moua Lee, Vice Chairman, Ban Vinai Refugee Camp, Pak Chom, Loei, Thailand.

Sir, in brief, a summary of my particular remarks would be that upon returning here 2 days ago I brought with me several more new specimens from both Laos and Kampuchea, some that were drawn as recently as the Tuesday before, and, unfortunately the "yellow rain" continues to fall in its several forms, both artillery-delivered and aircraft-delivered, primarily the former in Cambodia and the latter in Laos.

The situations do have some fluctuations. In the dry season, normally the military activity will pick up considerably, and we see the more classical use of chemicals mixed in with the use of artillery and mortars and the like, particularly within Kampuchea. Within Laos, we have seen continued use of chemicals in the Phu Bia and Ban Don area and, more recently, in November and December of this past year, we have picked up reports of use in the Siburi Province area, which is east of Nan. This is an area which has reported very little chemical experience before.

I wish I could give you evidence of complete cessation of use. This was hoped for, I know, by State Department personnel when the first exposure was made. However, for a weapon which has excellent value in a tropical setting in a highly difficult climate and mountainous terrain, particularly in Laos, it is ideal. When you have full control of the skies, when you do not wish to expend your own personnel trying to search out resistance forces in mountains that are very difficult to get around in, the use of aircraft delivery is, frankly, very simple, and microtoxins, from the best that I can currently understand, are relatively inexpensive to use.

Nowhere as lethal as many of the nerve gases, they are still very potent to either completely subdue the Hmong so that they have no resistance, or to drive them out of the country, which solves the problem as far as the Pathet Lao government is concerned.

I believe that this is all that I should add at this time, and I am open to questions.

[Dr. Townsend's prepared statement follows:]

PREPARED STATEMENT OF DR. AMOS R. TOWNSEND

Mr. Chairman and members of the subcommittee, I thank you for your invitation to testify before you.

Just 2 days ago I arrived in Washington from Thailand bearing specimens from alleged H'Mong and Khmer victims most of the latter obtained from within Kampuchea just a week ago. I use the objective "alleged" advisedly for there is really no proof in any particular case until the laboratory results match the history and physical findings. Certainly the likelihood of either the U.N. investigating team or myself being invited to witness a typical "yellow rainfall" must be considered rather providential at best.

Although individual cases may be in question from time to time there is no question in my mind that chemicals, or more than one type, have been, and are still being used against Lao-H'Mong and Khmer in SEA. Indeed, I was convinced of this by June 1981 although I had no firm idea of what types of agents were responsible for the bizarre descriptions of signs and symptoms

given by the H'Mong streaming out of the Lao jungles during April–June 1981. Attached is a copy of the report on my initial effort undertaken at the request of two members of the U.S. Embassy, Bangkok. Also attached is a more recently written plea given to me by two H'Mong leaders presently located in Ban Vinai Lao refugee camp, Loei Province, Thailand, for delivery to the U.S. Senate Committee on Foreign Relations.

Since the initial attachment explains how I, as a private citizen, came to be involved in the "yellow rain" investigation through the efforts of Lane and McWilliams under the blessings of Ambassador Abramowitz initially and later, Ambassador Dean and, since the State Department reports of March and November 1982 amply describe the results up to the latter date, I shall confine the rest of my remarks to my main personal impressions and concerns about "yellow rain" in particular and CBW in general. I am also adding some suggestions that might improve the quality and credibility of the current investigations of these allegations.

Although not nearly as lethal is most nerve agents, the mycotoxins, presently used, exhibit properties that are particularly useful against an enemy that does not control the skies, that has minimal CBW protective equipment, that is either incapable of developing a thorough knowledge of, or defense for, this family of agents, and that is located in a mountain fastness penetrated on the ground only at great cost in lives to an aggressor force. The jungle covered mountains of Laos are a far more formidable combat arena than my beloved New Hampshire White Mountains.

Since any country capable of producing antibiotics should eventually be able to produce mycotoxin CBW agents, there is a reasonable probability that mycotoxins will one day be produced even in some developing countries to either more cheaply subdue their more unruly minority groups or to war upon a less well equipped neighbor. However, to date I am convinced that the lethal CBW agents now used in SEA are of only Soviet or East European origin. Since the United States seems to be about 30 years behind the Soviets in the offensive-defensive military applications research on mycotoxins, I doubt that the United States could be in a position to thwart such a proliferation and use of this particular CBW weapon—particularly with our vacillating, on off, leadership of the "free world" over the past 20 years unless we respond with foresight, care and vigor. Indeed, we should anticipate further targets in the "third world", that is, in Africa and Latin America as well as Asia, at the hands of the Soviets or their surrogates.

In view of our deficit knowledge about all facets of military applications of mycotoxins, I am concerned that Americans might be unwilling to accept the challenge of expanding research in this area of CBW and of maintaining currency in all phases of potential warfare just because the thought of such war is too odious to emotionally accept as a potential reality. Indeed, it has been a reality to the H'Mong for nearly 8 years. Having faith in American technical expertise to "play catch-up before it's too late" is of little value if we are unwilling to pay the "daily maintenance bill" in each generation—to keep the sword well honed until the day that a bona-fide verifiable arms reduction and/or elimination becomes an established fact.

Apathy, isolationism and vacillation in U.S. leadership prior to 1939 all contributed to the misreading of the American character and will to sacrifice at whatever degree necessary to defend itself and its allies. I am concerned lest we repeat such terrible blunders again—and it matters little whether such blind escapism from international leadership responsibilities is led by the right or left wings of the U.S. political spectrum for the results would be the same.

In order to improve the quality and credibility of the current investigation, our leaders are urged to encourage both our allies in Europe and Asia as well as neutral nations to mount their own independent studies rather than argue over the merits of the present U.S. research. Well endowed U.S. universities that have both sufficient private funds and technical expertise should be encouraged to investigate the H'Mong, Khmer, Afghan and Eritrean allegations on their own with at least the same vigor attendant to their studies of agent orange, a defoliant that was pressed into service in SEA in order to save the lives of Americans and their allies.

Expanded detailed studies of all H'Mong, Khmer and Afghani allegations as well as the bringing to the United States of at least the more knowledgeable PAVN defectors would enhance our current investigations. They have been the source of much useful information—but, as it often does, INS has routinely

turned them down regardless of their contributions to the CBW research, greatly.

Short and long term pathologic-physiologic-epidemiologic studies of mycotoxin effects on the present and future victims in SEA and on those already in America should be undertaken, preferably in concert with Thai civilian medical experts.

After 8 years of CBW use against our H'mong allies, now is not the time to be professionally timid. The H'mong, described by other Lao ethnic groups as the "most honest people in Laos" have suffered severely and virtually alone. Indeed their capacity to absorb punishment and still stand firm is an inspiration to all who know them. Their still maintained faith and trust in America and Americans is an uncomfortable moral burden to bear for those of us who work with them. It is hoped that we, as a nation, will not procrastinate to that day when we might be called upon to display the same degree of courage as is now shown by the H'mong.

According to PAVN defectors Hanoi began to receive their initial CBW supplies from the Soviets in 1968–1969, after their disastrous Tet offensive of 1968 made North Vietnam much more vulnerable to a possible American-RVN counterinvasion. Although I believe that the Hanoi leadership was far too wise to have ever used CBW en masse against United States-RVN forces except as a last resort, I do have strong suspicions that CBW was used against some of our long range patrols that attempted to monitor the Ho Thi Minh Trail.

Members of the subcommittee, I thank you for this opportunity to testify before you today. The opportunity to give this little assistance to both the refugees and our country in its time of need has made my transition into "retired grand fatherhood" a very emotionally rewarding period in my life.

Interim Report of Chemical Warfare Use Against Hmong in Laos

(By A. Townsend, M.D., International Rescue Committee)

1. INVOLVEMENT

In late 1980 I was approached by two members of the U.S. Embassy in Bangkok while working as the International Rescue Committee (IRC) Medical Coordinator for Nong Khai Lao Refugee Camp. These two gentlemen, Mr. Ed McWilliams and L/C Denny Lane, asked me to keep alert for, and interview, new Lao refugees, especially Hmong, that appear in the Nong Khai camp or at nearby collection points, whenever the refugees voiced complaints of alleged use of chemicals against them while in Laos and with or without current and related physical complaints. Along with a few other physicians in the area I agreed to do so. My own reasons for doing so were both professional and personal. As a physician I felt that I owed it to my patients, both clinically and in a public health sense, to know as much as possible about anything that was a threat to their health or that could conceivably become so in the future. Having worked in the defensive aspects of BW/CW many years ago, I also was aware of the military and political nature of these weapons and felt that I might be able to help in a geographic area where such experienced U.S. personnel were rather rare. As a scientist of sorts I also felt that I owed it to society in general to, in a small way, assist in clearing away of some of the emotionalism that existed about this form of warfare in the western world. By doing so, fact might be separated from fiction and some of the myriad number of unanswered questions, which many of the national and international bodies seemed to be avoiding, might be answered more definitively.

I felt it would be too hypercritical for my own tastes to avoid the subject just because of my personal repugnance of such weaponry. In truth, I found it difficult to consider such weaponry as any "more immoral" than a lethal club in the hands of a person of murderous intent . . . but I do consider it as far more diabolical. In these days of debates about "clean weapons" that destroy people while preserving the real estate, it also seemed fairly obvious to me that a chemical weapon of the "right type" could have far more usefulness than any other weapon known thus far including the present "big bang" of the Neutron artillery shell currently under heated discussion. Chemical weapons with the 'right characteristics' could be virtually tailored for use by an individual assassin on the one hand or by an army against another military unit, a ship, a metropolis or a nation. With the alleged use of a chemical weapon against the Khmer Seri camp

near Ban Sangae in June 1980, it is not surprising that the Thai government feels threatened with its border just three kilometers away. They should . . . they are.

Another reason for becoming modestly involved with this little "research effort" was my concern for the Hmong as both a peoples in need without much voice in international circles and as former comrades-in-arms. I am afraid that the particular mode of exit and "clean up" of the U.S. involvement in SEA espoused by my previous presidents had only left within me a disquieting feeling where my conscience should be . . . . and, within the scene in SEA, very little peace and even less honor.

2. TIME OF INVESTIGATION

Until April of this year I had had little contact with Hmong thanks to the demands of my primary work and to the unfortunate assumption that any Hmong with such complaints would naturally and immediately try to contact authority figures among the Thai, the UNHCR and the farang Volags that were in abundance in the area. Of course, they rarely did and, when they did, their stories of massive suffering from an unseen foe were most often met with incredulity and an air of reticent and patronizing sympathy at best. On a couple of occasions I was called over to see Hmong patients with skin problems allegedly due to an exposure to CW agent months before. Both cases turned out to have scabies. Such encounters tended to dampen professional enthusiasm for the subject and to discourage the more thorough pursuit of medical history-taking which the subject deserved.

When IRC relinquished their long established role in the Nong Khai camp, they graciously allowed me to remain in the area for as long as I felt it would take to concentrate on the cases of alleged CW use among the newly arrived Hmong that Messrs. Lane and McWilliams had not been able yet to interview. Most of these were people who had arrived since January 1981. Some arrived during the time I was devoting most of my effort to the subject from 1 April to 16 June 1981. Whereas I had been informed that "only a couple" of samples from Laos purported to be chemical agents had made their way across the river prior to 1981 the number brought out in the first six months of 1981 increased dramatically, especially during the second quarter of the year. Much of this change can be attributed to an earlier and more vocal interest in the acquisition of such samples by Messrs. Lane and McWilliams as passed through the Hmong leadership at Ban Vinai. However, in several cases, the Hmong sample gatherers had not heard of U.S. interest but had simply wanted something to convince the Thai Border Police that they really did have very good reasons for fleeing to Thailand.

During this 3 month period, and with the help of Thai, Hmong and Lao friends as well as my own family, I had made 16 basic interviews and assisted in the acquisition of about 3 specimen restricted directly or indirectly at least 24 specific events with another 15 more alluded to. These all dated from February 1978 to April 1981. (There were some reported about which I could never seem to catch up with ostensibly because they had been given to "other people," Thai or foreign). I believe that L/C Lane was able to get a sample as late as June 1981, a story of a CW attack on Hmong as late as July of this year. (A report of a CW attack against a Lowland Lao group on 17 September 1981 has just been recorded.) Few, any, of the people I spoke with had been previously interviewed by Messrs. Lane and McWilliams for they had concentrated on earlier arrivals and were geographically inhibited from reaching these people as quickly as I could.

Usually the refugee leader had given any specimen he had brought with him to the Thai border police along with any of his more traditional medicine, i.e., opium. They tended to use this drug my mouth or inhalation when they realized they had been hit with a chemical. Generally the border police were quite cooperative and passed over the specimen to me. Although there were times when the specimen had been passed down through "other channels", Thai or farang, and was lost to my hands. On one occasion the Thai official came back and asked me for half the sample back . . . whereupon I found myself separating a chemical of unknown lethality in the living room of our little Thai home. Language and educational barriers were such that I could not convince the Thai official of the possible dangers (?) involved and of the need for sending the maximum amount to the analysts in the USA. That particular sample was a black powder

and, fortunately, thus far none of us have noted any untowed effects from the exposure.

In most cases I did not try to unwrap the specimen and examine it for I felt that my own curiosity was not enough justification to jeopardize the possible loss of such small samples. Regrettably I photographed only one—and that was at a distance. Most of the specimen were reported to be 1/3 months old by the time they were brought over the Mekong River and I was most anxious to get them, along with the interview report, to the chaps in the U.S. Embassy and thus on to the labs in the USA for analysis. Relative to the origin of these specimen it should be understood that they were usually scrapings off rocks, wood or leaves and done 72 or more hours after exposure, i.e., whenever the Hmong felt brave enough to get the specimen without a further loss in life. The Hmong are very afraid of these CW 'weapons' and what they have done in collecting these specimen has been done in the face of little sophisticated understanding of the chemical hazards involved. After getting the specimen they would have to traverse mountain and jungle trails, without travel permits, often fighting their way through ambushes and near villages of unknown political sympathies, finally to float, swim and fight their way cross the Mekong River which normally begins to rise in May with the melting snows in China and the early rains in northern Laos. Relatively few new Hmong have appeared since June 1981 because of the swollen Mekong River, the fear for the deep water among the inexperienced hilltribes people, and, this year, also possibly because the Royal Thai Government has become less hospitable to the refugees in general, choosing officially to regard life in Laos, Viet Nam and Kampuchea as being essentially back to normal with little or no justification for crossing into Thailand for a political sanctuary.

Chemical warfare also is influenced by weather conditions. This would explain why some of the Hmong noted frequent and repeated use of chemicals in the same area once the Monsoon rains had begun. Dilution is still a partial solution to pollution and the one that mother nature normally employs along with the natural degradation of chemicals to more stable and, hopefully, less toxic compounds.

3. AREAS OF INVOLVEMENT

The 16 interviews that were conducted involved almost solely two geographic areas of Laos with perhaps two thirds of the cases coming from the Phu Bia area, especially to the South, West and East. The Ban Don area further S.W. of Phu Bia provided the rest of cases. This was of particular interest because it is believed that most of the villages in that area are either old and were relatively "neutral" during the fighting a decade ago or represented new relocation camps usually with a population of mixed "pro and anti" Communist Hmong elements.

It was surprising to note that in several of the cases the villages were visited by PL/VC troops periodically from weekly to monthly, sometimes regularly and sometimes by surprise. In some cases such visits were almost borderline sociable while in others the visit came at the point of a gun and with the demand that everyone get out of their houses or get shot. At times boys from 12–18 would be taken away by force "for training for a few months," never to be seen again. A few attacked villages had PL/VC encampments actually situated within three kilometers of their locations. This situation would make the use of CW agents by aircraft a very challenging affair and force the users to develop special techniques to enhance accuracy. It is my impression that they are not always very accurate.

In some cases PL/VC personnel would appear 24–72 hours after the chemical's use and ask questions which would indicate that they were assessing the weapon's degree of usefulness under the conditions then present. In no case did the Hmong feel free to ask aid from any nearby military unit nor was it offered except in context of a post attack assessment. Reportedly the rare therapy consisted of "shots" of unknown types and value. This treatment might also have been experimental.

Although isolated villages were normally the target of such CW weapons, there were instances where crops in fields seemed to be the preferred target. In other cases several villages located within a few kilometers of each other would be hit in the same day. In no instances did I receive reports that the Hmong ever attempted to shoot at the aircraft for, even if they did have weapons, they considered it far too risky to take the chance. Besides that, many Hmong in some areas "often saw planes" and, with a ½ hour delay between the plane's passage and the awareness of a chemical exposure, only the more alert and militarily astute would connect the two, at least on the initial exposure to such a weapon.

4. MODES OF DELIVERY

In this group of cases it was very apparent that several modes were used for the delivery of the CW weapons in Laos. However, it was evident that the artillery and aircraft rocket modes were more prevalent before 1979 and were usually employed when the users felt that they had a Resistance force trapped and/or concentrated well enough to make it worthwhile. In such cases ground troops often followed up the CW weapon.

From 1979 on in Laos only aircraft were reported for delivery of this form of ordinance and they were variously described as: MG17, Helicopter, L–19 like—single engined propeller Type, four engine jet aircraft, two engine prop and four engine Turbo prop aircraft and a biplane. It is my understanding that the biplane, a Soviet aircraft, is one of the more common aircraft presently used for routine transport within Laos. Its high maneuverability along with short landing and take off characteristics would make it advantageous in such a highly mountainous country. The use of these multiple modes of delivery would indicate that the users were not settled on a single mode only as optimum. If groundfire were a real concern to the pilots it would seem a little more plausible that the larger aircraft might be tried experimentally in some cases and at higher altitudes. However, when the Hmong had to go by the sound of an aircraft alone in dense jungle, it would have been easy for them to confuse two engined propeller aircraft with the four engine variety. The Hmong reported the aircraft passed over at 4–8,000 feet in elevation above ground level in most cases. I do not put a high degree of reliability on their estimates of altitude, unless the reporter was a former soldier with some acquaintance with aircraft, altitude estimations and the "reach" of different weapons.

In most cases the CW weapon was reported to be moist and sticky if seen on the ground fairly soon after delivery. In a few cases "granules" appeared to be used instead of a purely mist form. The rice sized granules of an unknown substance could serve the purpose of providing a more sustained release of the lethal chemical once it was on the ground. Heavier particles would, of course, fall faster over a more defined area and be subject to less wind dispersal. The most common color seen was a yellow of variously described shades. Other colors included green and shades of blue/green with some eventually turning black. It should be understood that the colors might well be of a "carrier" substance rather than the lethal agent itself. Often no color or mist was noted until it was seen on the ground and leaves. There are many possible variables which could influence the use of such a weapon, variables besides the obvious one of the type of basic chemical used itself. The concentration of lethal agent, the altitude of delivery, the wind and rain conditions, the humidity in the air at any given time, the accuracy of the pilot and/or bombardier, surrounding terrain, nearby non-targets, the nature of the target itself, the carrier substance, the aircraft dispersal equipment available, the effect desired, and others. Artillery and mortar shells and aircraft rockets would normally contaminate a more precise area unless they were set for airbursts at considerable altitude.

5. RESULTS OF THE CW USE IN LAOS

Frankly, I have never been so baffled by such a conglomeration of symptoms as I have while listening to the stories told by the Hmong. Falling back to my past experience automatically, my initial conclusion was that the users must have found a technique for mixing two or more lethal chemicals. This is still a possibility. However, the current belief, by the few who try to stay abreast of such weaponry, that most of these cases represent the use of a new chemical that is not common to the arsenal of most countries, would seem to have validity. The research literature on mycotoxins has an inordinately large contribution by Soviet scientists, most of it in the last decade. The mycotoxins are known to produce a wide variety of symptoms which can vary when different mycotoxins are absorbed by the victim in different amounts depending on the characteristics and concentration of the toxins used. Lethality, of course, would vary with each chemical and to some degree with each victim, as well as with the immediate environment in which they interface.

The most striking symptom noted was the hemorrhaging from the gastro-intestinal tract and sometimes from the respiratory tree as well. It is known

that the mycotoxins interfere with normal clotting by "neutralizing" the effect of Factor VII and thromboplastin. Other symptoms of the mycotoxins include headache, visual disturbances, nausea, vomiting, diarrhea, dyspnea, vertigo, fatigue, generalized pruritis of the skin with small blisters later appearing, disturbances of thought processes, coughing, sneezing and a general ineffectiveness for purposeful activity. Most of the common domestic animals belonging to the Hmong seemed to be affected somewhat similarly and often died at greater rates than did man. Death could come in minutes to weeks after exposure.

It is also notable that in many cases the foliage was often damaged at the same time that the animals and man were affected. The possibility of a defoliant being used either alone, or with a lethal chemical, does also exist although this combination is believed to be much more difficult to bring into effect. Of course, it is quite possible that more than one lethal agent for man can also be pathologic to plants as well.

Related to any evaluation of this sort of data and the many accompanying symptoms would be the basic condition, the state of health of the Hmong generally, and their cultural responses when faced with this sort of dilemma. Having migrated southward from China over the last several hundred years these people are very near to the end of their viable choices. They are trying very hard to maintain their distinctness as a people but, with a less hospitable Thailand facing them, a regime behind them that is dedicated to destroying them as a separate entity and a China that is not at all anxious to add to their present ½ million strong Hmong minority, there are few alternatives left. Their diet is very low in protein now. Only their fowl and fish can be butchered without special permission. The quality of their farming has always been very marginal in the small valleys and hillsides of the upland mountains. Like other rural Asians they often have a heavy load of intestinal parasites stealing food from them and keeping them, along with the diet, in a chronic anemic state. They have almost been devoid of modern medical assistance except during the recent war. Education has also been very limited with literacy in Lao Hmong below 10 percent among males and below 1 percent among women. Much of that little education was a result of the training given a decade ago primarily for military purposes. Now it would appear that they will finally be "trained," again for military purposes or labor battalions set up to build and defend the very system of government they sought to defeat.

The Hmong capacity to absorb privation and physical punishment as a people is phenomenal. It is very much like that of the Montagnard even though the latter are of a totally different race. However, the current more educated Hmong Leaders are beginning to ask many serious questions. It is my hope that we are finally beginning to find answers.

6. CONCLUSIONS

Interim conclusions will naturally be enhanced by the publication of laboratory data on the several specimen that have been sent to Washington via the U.S. Embassy. Preliminary results would indicate that all of this exercise of "field research" has been worthwhile. However, based on the stories and on the gross presence of alleged "chemicals" as passed on to us by the Hmong refugees, the following are my tentative conclusions:

(a) Chemical(s) of some sort have been frequently used against the Hmong peoples in Laos for the last 5 years. Whereas the accuracy for detail and the more scientific relationships of "cause and effect" may be at fault in varying degrees in the cases as related to me, the basic element that pervades each of them is too convincing for me to ignore. If these were Europeans, Americans or other more sophisticated Asians I would still listen carefully but would be far more suspicious of prefabrication than I can be here and now. The similarity of symtomology with the reports that are coming from Afghanistan and those that came from Yemen is also too great to dismiss as just the result of fanciful imaginations or deliberate lies.

(b) The agent(s) used are different from those traditionally used, or ready for use, in previous wars over the past 80 years. Until a better theory is broached the most likely candidate(s) is/are one or more mycotoxins as Mr. Seagrave has postulated. A review of the cases indicates that the mycotoxins are a better fit to the puzzle than a combination of some of the more traditional chemicals previously stockpiled.

(c) The people who made use of these weapons in Laos did so often in combat situations from 1976 to about 1978. Since that time use has continued essentially against defenseless and unsophisticated peoples who are controlled and relatively immobile in mountain valleys or hillside villages. Other reports would suggest that "purely military" use of these agent(s) has now shifted to Kampuchea.

(d) The continued use of the CW agent(s) against the present Hmong population in Laos, a country which the PL, VC, Soviets, Royal Thai Government, and even the U.N. has determined is now "essentially back to normal," i.e., pacified, would indicate that the users are doing so either to cower the Hmong population into total submission, with or without extinction, or to drive all but the most submissive out of the country, or to further refine their techniques of delivery and agent assessment. Regrettably I must conclude that currently the Hmong in Laos are being used as "laboratory animals in a natural setting for deliberate experimental purposes." The many styles of agent delivery seen over the last 2 years up to July 1981 tend to support such a conclusion. Reports would indicate that the ferocity of resistance by the Afghani is such that careful "scientific evaluation" of agent effectiveness in that setting would be difficult at best as compared to Laos. The geographic spread of the agent(s) as reported during this past year would also suggest to me that the Hmong resistance, although determined, is not as significant militarily as some have indicated.

(e) There is no known antidote for this agent(s) as yet. The Hmong use opium which slows down the gut motility but has nothing to do with the anticoagulant effect of the agent(s). A handy hospital with an inexhaustible supply of blood and other supportive elements such as normal saline, plasma expanders, cortisones, antibiotics and a diurhetic might be able to save some of the borderline cases but very few and at a considerable price which would likely make it impractical on a large-scale.

(f) An elementary defense for the individual would involve primarily total body cover and prevention from inhalation of any of the agent(s) used . . . relative to the mycotoxins specifically. This would be very difficult to do in a tropical environment particularly when one would not become aware of any CW presence until it was smelled, seen on one's person, or in the surrounding environment. It would most likely be too late for effective protection at that time. If a person was near a substantial body of water and could protect his inhalant air he might conceivably be able to survive while the agents were still in the process of landing in the area.

(g) The use of this agent(s) on a large scale against a sizable target population would force any defending country which did not have such a "matching weapon" to counter with massive firepower, i.e. in most cases nuclear weapons of some type and dimension. I would suggest that one low altitude penetration of even a fighter jet like the aged MG–17 could effectively neutralize cities like Bangkok, Berlin, Belgrade, Copenhagen or Seoul, with one pass alone. The dead would militarily pose little problem to the surviving but those only made ill would be a significant problem for the rest remaining alive and well. It is also very doubtful to this writer that present air-conditioning would provide significant protection within buildings. Witness a modest vehicular accident on a main artery in Bangkok during "rush hour" and you might begin to perceive the impact of such a chemical agent(s) on a metropolis. If a larger but still swift aircraft were to be used over large population centers is quite possible that the survivors would prefer to surrender.

(h) After studying the current multiple delivery techniques for this weapon and relying on my nearly two decades as a USAF Flight Surgeon with duty on four continents, I am forced to conclude that this weapon has excellent surprise potential. Low altitude fighter/bomber penetration below most radar "sight" could in minutes neutralize opposing airfields, supply depots and concentrated armour without destroying their future usefulness. Troop concentrations, unless very alert and armed with modern anti aircraft weaponry such as the singleman surface to air missile, would be particularly vulnerable by day or night. It is also possible that a long range transport aircraft could approach an unsuspecting metropolis on a routinely scheduled flight and, under the guise of navigational or control problems, vere over population centers, release its deadly unseen cargo and be long gone before the presence of lethal agents became public knowledge.

With the element of surprise in the cover of darkness or the usual "rush hour" confusion around 17.00 hours on any Friday in most cities, this form of attack would not necessarily be a costly adventure initially. Its demoralizing impact, without significantly damaging real estate, would be considerable. The discomfort that such a scenario gives us should not be allowed to becloud its plausibility. Afterall, who would have thought that any totalitarian regime would have gotten a 15+ years research and development "jump" on the "Free World" with such a potent weapon.

7. FUTURE NEEDS FOR IMPROVED STUDY OF THIS SUBJECT AND SAFETY OF HMONG IN LAOS

(a) More and fresher specimen.
(b) Photographs of the victims.
(c) Pathological specimen including blood, urine, feces and tissue specimen (liver, lung, gastrum, esophagus)—if a normal autopsy is not possible.
(d) Evacuation of salvageable sick to a safe and sophisticated environment.
(e) The acquisition of a sample of this agent(s) and some of the delivery ordinance pieces.
(f) More active research in this area of defense by developed Free Nations.
(g) Cessation of CW agent(s) use in Laos either by their removal or destruction.

8. OTHER CONSIDERATIONS

It is quite possible that, as in Yemen, the exposure that has come about in the press over the last few weeks may discourage the users from quite so blatant a display of an obviously well-developed and many faceted weapon. Review of such weaponry within national chambers will undoubtedly take place. It is very long overdue. Thanks to the attendant publicity over an agent(s) that is believed to have been in at least one nation's arsenal for 14 years or more, it is possible that for a while the Hmong, an isolated and poorly represented people on the international scene, will receive at least a modicum of voiced concern by those international bodies ostensibly designed for their protection as much as yours and mine.

Perhaps also, because of the careful work done by Mr. Seagrave, the Free World Press and intelligence communities will react with fewer cynical reservations to wild stories that may come out of the backwaters of the world regardless of whether or not such countries are considered to be of strategic importance to one great power or another, even if there are no special orders to examine a particular field of concern at the time "something peculiar" occurs in a distant land. It is still puzzling as to why the alleged Yemen use of this agent(s) was not more vigorously pursued and why the early reports out of Laos in the French Press in 1976 did not seem to evoke more interest in the intelligence communities of many countries and in the Free World Press. Smug indifference is as dangerous to a Free Press as is an automatic genuflex toward any particular ideology. Naivete is similarly as dangerous. I hope I never again have to listen as I did in August 1981 to a Senatorial staffer whose historical perspective is such that it would permit him to say that he "would not like to think that the Soviets were that diabolical"—apropos the use of CW against the Hmong.

Militarily as well as morally Laos and the Hmong are right next door to us all for no thinking person could accept that the agent(s) in question were conceived and birthed in Vientiane or Hanoi. Nor could such a person believe that these weapons of war would always be restricted to the likes of the Hmong, Lao, Khmer, Afghani and Yemeni of the world.

Perhaps Americans will find out exactly what the Vietnamese Peoples Army (VPA)—chemical branch did a decade or more ago to earn the Hanoi announced citation by Col. Gen. Le Trong Tan in April 1980—allegedly for countering enemy acts "with chemical weapons". Perhaps also some of the attitudinal retreat into "spendid isolation" that has been creeping into manyof the countries of the "Free World" will now be held in abeyance—at least for a little while.

[NOTE: Report provided by Dr. Townsend is retained in committee files.]

Case No.	Date of event	Place	Mode of delivery	Weapon description	Reporter
1.	Oct. 25, 1930 (last of 5 episodes was Apr. 2, 1981).	Phu Dia TF 69/59 (coordinates)	MG 17	Yel/Oran powder	Resist Ftr.—29 Literate.
2.	Jan. 8, 1981	Phu Bia TF 69/59 (coordinates)	MG 17	Yel "light rain" odor of rubbed bamboo sticks.	Do.
3.	Mar. 11, 1981	PB TF79/73	Helo	Dark Yel—same odor	Do.
4.	Mar. 22, 1981	PB same village	Biplane	Uncertain—my error	Do.
5.	Apr. 2, 1981	PB TF91/77	MG 17	Yel, no odor noted	Do.
6.	Apr. 1, 1981	SF 82/67 N side of Mtn W of Ban Don	Jet A/C by sound-like fighter type	Yel, sticky turning to dust	Vil Ldr-35.
7.	Jan. 4, 1981	Somewhere on trail from PB ?UF 19/95.	Biplane AL–2 Type	Yel, sticky, rice sized, odor of rubbed bamboo.	32-gp Ldr.
8.	Late January 1981 (last of 3–4 episodes)	N side of Mt Phoncatar, 4 days walk of Parksane.	4 Eng Prop Prev eipsodes MG 17	Yel, rice sized pellets	30-gp Ldr (notes lost at River Xing fight) Literate.
9.	At Mid-March 1981 (last of many episodes from November 1980 on).	TF 97/97. E slope of Mtn W of PB	2 Eng Prop	Brt Yel, sticky, like lt rain, odor of smoke.	45-gp Ldr.
10.	a. Aug. 18, 1978	a. SE of PB UF 92/14 in a valley	a. Artillery 105s and 85s	a. Yel or Grn smoke	55-Vil. Ldr, Lit.
	b. Aug. 21, 1978	b. Ditto	b. L19 type of A/C	b. Yel smoke and odor of camphor	
11.	a. Sept. 3, 1980	a. RA68/08, 5 Km W of Ban Don	a. Biplane Grey/White	a. Mist from plane but no one in flds to see.	56-Vil. Chief, Lit.
	b. Sept. 18, 1980	Flds 3 Kms away	b. Ditto	b. Yel spots on grd "like eye ointment".	
12.	a. Aug. 18, 1980	a. US99/18, E of PB	a. Jet ftr	a. Red smoke yielding Yel powder	40-Farmer, Resist. Ftr.
	b. Aug. 29, 1980	b. Ditto	b. Jet ftr both with rockets exploding 4,000 AGL.	b. Grn smoke yldg lt blue rice sized pellets.	
13.	September 1980	TF 35/78 4 Km E of Phu Klao Khoua	Biplane	Yel rice like pellets sticky then dry, odor of "hot pepper". Heard them hit leaves.	40-Vil. Ldr. Literate.
14.	Mar. 15, 1981. Began in January 1980 many visits esp. after rains.	TF63/98 Ban Pu Xu Vly SE of PX Mtn.	Lrge Jet like B–52	Yel sticky then dry like rain in sound. No odor noted.	24-Lt in Resist. Force.
15.	a. Feb. 2, 1978	TF85/87	a. Helo B8 type	a. Yel sticky rain like odor TNT	Chief of 6 Vils 40-Frmr, Res Ftr.
	b. Apr. 7, 1978	E of Phu Kong	b. Like C–130	b. Dk Blu Stky odor of burning pepper	
	c. June 1, 1979	Kao	c. Biplane	c. Lt Gn mist. odor of burning clothes	
	d. Mar. 1, 1981	Fields at TF82/84	d. Raven type like L–19	d. Yel powdr, rain snd odor TNT	
	e. Apr. 5, 1981	TF86/87	e. Helo B8 type	e. Yel Br Pwdr. rain snd, odor of burning charcoal.	
16.	a. Nov. 9, 1980	RA68/14	a. 4 Eng Prop A/C by sound. b. Same seen.	a. Nothing noted on grnd or levs. No prior experience. b. Lt Blu spots on grnd.	35-former Lt for VP but illit.

Case No.	Animal/human results	Plant results	Conclusion
1.	NVD with blood, Hemoptysis, 30 of 120 ill. Blisters—serous rhinorrhea, sneezing, coughing.	Leaves browned in two weeks esp. tapioca.	X Defol.? Vesicant?
2.	Hemodiarrhea, small blisters, HA, dyspnea, edema of eyelids, blurred vision and mentum, thick sputa, increased pulse, diaphoresis, "hot body" sensation, fitful sleep. Hemodiarrhea noted in 24 hrs but lasting two weeks. No deaths of animal or humans noted.	No comments made	X.
3.	61 of at 1,000 with bloody NVD and died. Skin initially cool then intensely itching. HA, lid edema, blurred vision, chest pain, tearing.	Leaves wilted and browned in two weeks then fell off.	X.
4.	Of 1,000 in village at 500 got hemodiarrhea, 400 got blisters and 21 got afebrile cough and died within 2 weeks after 3 episodes of hemoptysis. Exudate from blisters caused new blisters which also got infected.	As in No. 3	X? Defol.? Vesicant?
5.	Village of 450, 24 get bloody diarrhea and die in one week, usually from one week of onset of Sx. 47 got blisters and secondary skin infections. 13 of 100 pigs and 123 of at 500 chickens died within two weeks. (Forgot to ask about beef and buffalo).	No comment made. My error	X Vesicant?
6.	500 people in 3 villages noting symptoms of "cool" skin. HA, thick sputa, drunkeness, vertigo, faster pulse, dry cough, tearing, conjunctivitis, blurred vision lasting about 5 days, no human or animal deaths noted but 9 of 500 noted NVD without blood after a feast allegedly garnished with contaminated onions . . . of dubious value.	Brown spots on leaves where chemical touched, with some later changes.	X?
7.	At 250 on exodus trail, most noted dyspnea, 2 noted hemoptysis and hemodiarrhea with one dying, both were healthy in early 20's, unconscious a few hours post exposure. Were in deep jungle. This group lost all but 71 by the time they crossed the river. No animals present on the trip.	Unknown, kept moving	X?
8.	Last of several episodes ended in death of 35 yr old man with dyspnea and darkened skin. 70 percent of fowl and pigs and 30 percent buffalo died. As in previous episodes animals fared worse than human according to this reporter. No Hemoptysis or hemodiarrhea were noted.	Burned where touched both broad leafed and grass types including rice, and veg.	X? Var.? Defol.?
9.	2 of at 60 died allegedly from eating vegs. contaminated with chemical in this episode, 2 infants and two young adults died after prev. Nov. episode. Most of fowl and pigs died within hours to days this time, much like previous episodes. No hemodiarrhea or hemoptysis but violent NVD.	No plant damage was noted with this or previous episodes on this village.	X? Var.?
10.	a. Many with drunk feeling and diarrhea without blood. No deaths reported.	No damage looked for or noted	Nerve? Riot? X war? X.
	b. 18 of 164 survive symptoms of hematemesis, hemoptysis, hemodiarrhea, rhinorrhea, conjunctivitis. No animal comments. Most deaths in 15 minutes.	No damage noted	
11.	a. No humans present. No animals present. Farm fields only hit.	a. Rice, tree leaves, and shrubs died in 3 days. 50–70 percent crop loss est.	a. Defoliant.
	b. Same farm fields. Old woman present. She noted NVD with blood "drunk" feeling, lasting 2 hrs. Woman noted at 100 chickens "lose sight" and die in 24 hrs and 3 dogs who were affected were found dead by a nearby stream the next morning. NV 12 hrs only Rx with opium.	b. "More plant damage"	b. Defoliant X.
12.	a. Pop. at 500. Many ill 4 plus days with no deaths. Sx of Hematemesis, vertigo, cough, dyspnea, rhinorrhea, tearing, conjunctivitis. All chickens and most pigs died. Beef/buffalo ill for a week.	a. Rice crop 70 percent destroyed. Tree and shrub leaves off in a week.	a. Defol.? X?
	b. Humans--NVD with blood, dyspnea, coughing, rhinorrhea, tearing, blindness, temporary for some permanent for others, very bad smell but no skin problems. No animals for it was a Resistance camp.	b. Same as in other village	b. X Defol.? Nerve?

Case No.	Animal/human results	Plant results	Conclusion
13.	Up to 50 percent ill of 909 pop. with recovery for most in a month. 34 died after 2 wks of NVD with blood. Many with vertigo and 50 with temp. loss of sight. All animals, fowl, pigs, beef and buffalo died.	70 percent of rice crop lost. Tree and shrub leaves dead in a week.	X Defol.?
14.	Rash on 40 percent of 1,000 pop. Fowl became ill but no deaths in either group was noted. They had only a few chickens and ducks.	Rice and small plants died. Trees and shrubs lost leaves in 1–4 weeks and trees put out new leaves weeks to months later.	Defol.
15.	a. 6 villages with 5,000 in 1978 but only at 1,500 by early 1981. Humans with "drunk" sensations for 1 hr. NVD without blood for about 1,200 of 1,500 in the 6 villages with at 800 dead within two days usually after convulsing following severe NVD. Many with small 1–2 cm skin blisters. Fowl and pigs all die convulsing within the hour.	a. Leaves turn Yel. dry and fall in one week incl. rice, corn, tapioca, and vegs. Trees survive.	X? Var.? Nerve? Defol.?
	b. At 1,000 ill with at 500 dead in two days with Sx of NVD with blood, dry cough, chest pain with cough 2 plus hrs, muscle spasms "all over body" often with lack of eyelid control, sensation of hot nose and throat. Animals—the few fowls left died..	b. Leaves turn hard and stiff (old ones) but remain green and fall off in a week. Young leaves wilt first.	X Defol.?
	c. At 3,000 ill with a cough and diarrhea hemoptysis and anorexia. Only at 40 died allegedly because of early opium therapy. Fowl that ate chemical ran about, convulsed and died. Some chickens and dogs survived.	c. Nothing significant noted for Hmong were burning in seasonal manner.	X.
	d. In fields of unknown population at 150 were ill, 50 died after symptoms of HA, fever/chills(?) and convulsions. No animals were in the fields.	d. Leaves on trees became stiff. Nothing was planted at that time.	X Var.?
	e. At 1,000 ill and 60 died in one week with symptoms of dry cough, sneezing, chest and back pain, dyspnea and hemoptysis. No animals present.	e. Nothing noted because of the dry season.	X Var.?
16.	a. 2–3 hrs post A/C pass Sx developed were HA, cough, vertigo, "drunk" sensations, syncope, coma. By 6–10 hrs post A/C many noted NVD with blood. At 12 died and 100 ill. The 12 were under 5 yrs of age. Animals: 40 percent of chickens died plus some other animals. The survivors got well in a month.	Nothing noted.....	X.
	b. NVD with blood. Cough, vertigo, syncope, and HA for many even on waking up. At 20 under 5 died in 1–2 weeks and 1–200 more were severely ill. Severe uncontrollable diarrhea seemed to be the prelude to death. Animals: chickens 100 percent died, pigs 90 percent, goats 75 percent, beef 90 percent, buffalo 95 percent.	Leaves on trees and shrubs dried and fell off in a month. Corn died. Rice not in season.	X.

Note.—Abbreviations: AGL—above ground level, Blu—Blue, Brt—Bright, BW—Biological Warfare, CW—Chemical Warfare, DeFol—Defoliant, Dk—Dark, fids—fields, frmr—farmer, Ftr—fighter, Gn—green, gp—group, grnd—ground, HA—Headache, Helo—helicopter, incl—including, Ldr—leader, Levs—leaves, Lit—literate, Lt—light or lieutenant, Mtn—mountain, NVD—Nausea, vomiting, diarrhea, Oran—orange, PB—Phu Bia, Phu—mountain, PL—Pathet Lao, Prev—previous, Pwdr—powder, Rx—therapy (curative or preventive), SEA—South East Asia, Snd—sound, Stky—sticky, Sx—symptoms, Var—variant, VC—Vietnamese Communist (Viet Cong), Vegs—vegetables, Vil—village, Vly—valley, VP—Gen. Vang Pao, X—an unknown, CW agent, Yel—yellow.

Senator PRESSLER. Did you bring back some specimens with you?

Dr. TOWNSEND. Yes, sir.

Senator PRESSLER. And where are those?

Dr. TOWNSEND. I passed them on to a young man as soon as I arrived at National Airport.

Senator PRESSLER. And they are testing them over at the Defense Department or someplace?

Dr. TOWNSEND. Yes, sir.

Senator PRESSLER. Who is analyzing those specimens?

Dr. TOWNSEND. They are received by the Department of Defense and usually distributed to at least two Government laboratories and then further distributed to private laboratories in different parts of the United States.

Senator PRESSLER. Who will announce the results of these analyses? When will we know what they contain?

Dr. TOWNSEND. Normally I receive announcements weeks to months afterwards.

Senator PRESSLER. Weeks and months, did you say?

Dr. TOWNSEND. At least over in Thailand.

Senator PRESSLER. All right. I want to ask you some more questions, but let's hear from Mr. Seagrave first. Can we do that at this point? Please summarize your statement and we will then proceed informally.

If anybody has anything they feel they have not had a chance to say, you will get a chance to say it. If you could summarize your overall thesis in 5 to 10 minutes, then we will get back to you.

STATEMENT OF STERLING SEAGRAVE, AUTHOR OF "YELLOW RAIN," STEVENSVILLE, MD.

Mr. SEAGRAVE. What I will do, Mr. Chairman, is skip the first half of my remarks, as they are in your hands anyway.

I was able to determine 3 years ago during my trips into Afghanistan that the medical symptoms of chemical attacks there and also in the Yemen civil war 15 years earlier were amazingly similar to those in Laos and Cambodia about 3,000 miles away.

The people in those remote and widely separated areas were all dying in a very peculiar fashion. It was very likely that they were being killed by the same group of poisons, perhaps in different mixtures and combinations. The only other common denominator that I could establish was that the Soviet Union was involved heavily in all four locations.

Since then I have reluctantly drawn the same conclusions recently about Ethiopia. Although I am working on other subjects now, I continue to keep apprised of developments on "yellow rain" and I think some of the following may be of interest to you and to the committee because it falls in an area which cannot be discussed by government witnesses for diplomatic reasons.

Although the United States was the first to go public on these new poisons, the French Secret Service had apparently already drawn the same conclusions months earlier, based on physical evidence brought out of Laos in 1978 and 1979 by French paramilitary commandos. More than a year ago, the West German Government announced in

Parliament that it had confirmed the "yellow rain" evidence independently, but this was not published outside of the West German press. In the last few weeks, the West Germans have again repeated this before the Committee on Disarmament in Geneva.

More than a year ago a government toxicologist in Norway disclosed to me privately, and to others, that they had also confirmed this by their own separate investigation in Norway. Since then they have repeated this in public.

Last December I decided to investigate the French evidence personally to see what it consisted of and why it was not being revealed. In Paris I was informed by senior French military officials that they now have abundant laboratory evidence from both Afghanistan and from both countries in Indochina and plan to go public this April, several weeks from now, by which time they believe that their evidence will be so overwhelming that even the most determined critic would be unable to challenge any aspect of the case. Their long silence, they said, was because they did not want to be open to ridicule on points in their evidence, as has happened for 2 years to the American evidence.

Since then, the French Embassy in Bangkok has admitted some of the essence of this to reporters there. Only the United States and Canada so far have made their investigations completely public, but more than a dozen nations have confirmed the evidence privately. This is government-to-government. These include Norway, Sweden, Denmark, West Germany, France, England, Israel, South Africa, Australia, China, Thailand, Singapore, and New Zealand, which has been pushing particularly hard for further U.N. investigations.

Of particular interest in the French evidence is the fact that this was developed by a government and a military and scientific community that is distinctly Left-Socialist. The private groups that have produced physical evidence from Afghanistan have included doctors of the organization called Medicine Sans Frontieres, which is generally characterized as Left-Socialist. One of their doctors was recently captured by the Soviets inside Afghanistan, arousing considerable anger in France and, I think, causing the Soviets to regret that they had caught him.

The French Left appears to be even angrier than the French Right about the Soviet introduction of these grotesque poisons. I think because it gives the Socialist cause yet another cross to bear on top of the suppression of Poland and charges of KGB involvement in the attack on the Pope.

It should be clear that the French role will go a long way toward discrediting charges that the whole "yellow rain" issue has been fabricated by the lunatic Right in America.

Recent reports in the Middle East also indicate that the Soviets may have recently provided these poisons to Iraq for its use if it seems about to be overrun by Iran. Last December 18, for example—this was extensively covered in the Middle Eastern press but not reported in the West—the Iranians claim that the Iraqis had used poisons in a major military engagement with heavy-running casualties. And reports also have come out from the Kurdish tribesmen for the last 8 to 12 months indicating that Iraqi Armed Forces have been experimenting with those same poisons on the Kurds, presumably to get practice.

I have been able to determine that the Iraqi Government purchased large quantities of advanced chemical protection gear, including masks and costumes, in France over a year ago.

In closing, the question arises: Why are the Soviets using poisons? I think the answer is really quite simple. In a nuclear stalemate, only conventional weapons can be used in regional wars, but conventional weapons have become so complex and expensive that, as we well know, a new weapons system can bankrupt a national economy.

Poisons, on the other hand, are cheap and yet have the killing power of nuclear weapons without attracting so much attention. There is no big bang and there is no mushroom cloud. But all the people can be removed silently and secretly, as they have indeed now all been removed from the northeastern tip of Afghanistan.

The new poisons are so bizarre that they can be denied completely, making proof extremely difficult to obtain. But any serious study of Soviet military doctrines demonstrates that not only is CBW defensive gear a routine part of Soviet operations, which is widely acknowledged, so is CBW aggressive gear, which is not well known at all.

In Afghanistan, for instance, Soviet helicopter gunships equipped with lethal chemical agents now perform routine duties like the protection of flanks during the movement of military forces, which is a duty that used to involve sweeping operations by ground forces. This is only one of scores of examples available that show the growing dependence of the Soviet Armed Forces on poison weapons.

Poison tactics and poison strategy have taken much of the role previously assigned to tactical nuclear weapons in Soviet doctrine. It is ridiculous to expect the Soviets to stop employing a weapon that is proving so useful. To stop using chemical weapons would require abandoning hundreds of millions of rubles-worth of specialized military equipment now actively in use in the field.

The sooner we realize that we have entered a new age of poison weapons, the sooner we can deal with it realistically. Obviously, at least those arms control agreements that have to do with chemical and biological poison weapons have proved to be a sham, at least from the Soviet point of view, and the sooner we can distinguish real goals from sham, the sooner will we make strides toward genuine arms control.

Thank you.

[Mr. Seagrave's prepared statement follows:]

PREPARED STATEMENT OF STERLING SEAGRAVE

Mr. Chairman, members of the Committee, I am Sterling Seagrave, author of a book titled Yellow Rain, which first correctly identified the new biotoxin weapons three years ago, more than six months before tests were conducted by the Government to see if the theory was correct. I am a writer and journalist by profession. I currently live on the Eastern Shore of Chesapeake Bay, where I make my living writing books. In the course of researching and writing Yellow Rain. I never accepted money or assistance from the U.S. Government in any way, although I was able to pry a certain amount of information out of individuals in the Government. Since the book was published, the only money I have accepted from the Government was a small honorarium for giving seminars on Yellow Rain at several U.S. Embassies in Europe. The book is now about to be published in seven foreign language editions. Until comparatively recently, I have had no particular interest in chemical or biological weapons, so I am here today as a result of two unexpected quirks of circumstances.

18-467 O - 83 - 7

The first of these has to do with origins. I am an American citizen whose family have been teachers and doctors in Burma for nearly 200 years. I grew up in Burma and have spent most of my professional life in and around Southeast Asia. In 1965 I resigned from The Washington Post in order to spend the next 10 years in Asia as a freelance correspondent. In addition to magazine and television assignments during the Vietnam War period, I had a commission from the Sierra Club to do a book on the countries of the Mekong River, and this took me on numerous trips on foot and by dugout throughout the more remote mountain regions inhabited by hilltribes and opium warlords. Because of this, and because of my long acquaintance with the hilltribes during childhood, I was in an unusual position to determine whether the earliest reports of poison weapons in Laos were true or fairy tales.

The second quirk came about when I began to investigate those reports in the late 1970's. I was then working for Time-Life Books here in Washington, but spent my vacations in Asia on assignments for various magazines. I used these trips to make investigations of the poison stories on the spot. On one of these trips, I was present when a U.S. Army doctor, Dr. Charles Lewis, drew the conclusion that the symptoms of the victims included one very peculiar symptom, of quick and massive internal bleeding, that could not be attributed to any known military chemical.

It was this theory of Dr. Lewis, which was totally ignored by the Government at the time, that caused me to spend the next 3 years comparing reported symptoms with all the poisons that might produce them. This led me in the end to the fungus poisons called tricothecenes, or T-toxins, and to write my book Yellow Rain.

There was at least one person in the Government, Dr. Sharon Watson, who had already arrived at the same conclusion. But the Government was busy testing the physical evidence for traces of familiar military poisons and was not interested in testing for T-toxins. My book had been finished for 6 months, and was already being circulated in galley proofs before the Government undertook the tests that led to Secretary Haig's first announcement in September 1981.

What this all demonstrates, I believe, is that we are painfully slow in accepting that very peculiar new weapons can be developed and used right under our noses, with great cost in human life.

I was able to determine 3 years ago, during trips into Afghanistan, that medical symptoms there and in the Yemen civil war 15 years earlier were amazingly similar to those in Laos and Cambodia thousands of miles away. If people in these remote and widely separated areas were all dying in a very peculiar way, it was very likely that they were being killed by the same group of poisons in different combinations. The only other common denominator I could establish was that the Soviet Union was involved heavily in all four locations.

Since then, I have reluctantly drawn the same conclusions about Ethiopia.

Although I am working in other subjects now, I continue to keep apprised of developments in yellow rain, and I think some of the following may be of interest to the committee, because it falls into an area which cannot be discussed by government witnesses for diplomatic reasons:

1. Although the United States was the first to go public on the new poisons, the French secret service had apparently already drawn the same conclusions months earlier based on physical evidence brought out of Laos by French paramilitary commandos.

2. More than a year ago, the West German Government announced in Parliament that it had confirmed the yellow rain evidence independently, but this was not published outside of the German press.

3. In the last few weeks, the West Germans have repeated this conviction before the Committee on Disarmament in Geneva.

4. More than a year ago, government toxicologists in Norway disclosed to me privately that they had also confirmed the evidence. Since then they have repeated this in public.

5. Last December I decided to investigate the French evidence personally, to see what it consisted of and why it was not being revealed. In Paris, I was informed by senior French military officials that they now had abundant laboratory evidence from both Afghanistan and Indochina, and planned to go public this April—by which time they believed that their evidence would be so overwhelming that even the most determined critic would be unable to challenge any aspect of their case. Their long silence was because they did not want to be open to ridicule as happened for 2 years to the American charges.

6. Since then, the French Embassy in Bangkok has admitted the essence of this to reporters.

7. Only the United States and Canada so far have made their investigations completely public, but more than a dozen nations have confirmed the evidence privately. These include Norway, Sweden, Denmark, West Germany, France, England, Israel, South Africa, Australia, China, Thailand, Singapore and New Zealand, which has pushed hard for further U.N. investigation.

8. Of particular interest in the French evidence is the fact that this was developed by a government and a military and scientific community that is distinctly Left Socialist. The private groups that have produced physical evidence from Afghanistan have included doctors of the organization Medicine Sans Frontieres, which is generally characterized as Left Socialist. One of their doctors was recently captured by the Soviets inside Afghanistan, arousing considerable anger in France, and I think causing the Soviets to regret that they had caught him.

9. The French Left appears to be even angrier than the French Right about the Soviet introduction of these grotesque poisons, because it gives the Socialist cause yet another cross to bear on top of the suppression of Poland and charges of KGB involvement in the attack on the Pope.

10. It should be clear that the French role will go a long way toward discrediting charges that the whole Yellow Rain issue has been contrived by the lunatic Right in America.

11. Recent reports in the Middle East indicate that the Soviets may have provided these poisons to Iraq for its use if it seems about to be overrun by Iran. Last December 18th, for example, the Iranians claimed that the Iraqis had used poisons in a major military engagement. And reports from Kurdish tribesmen for many months indicate that Iraq has been experimenting with these poisons on the Kurds presumably to get practice. I have been able to determine that the Iraqi Government purchased large quantities of advanced chemical protection gear including masks and costumes in France over a year ago.

12. In closing, the question arises why are the Soviets using poisons? I think the answer is quite simple. In a nuclear stalemate, only conventional weapons can be used in regional wars. But conventional weapons have become so complex and expensive that a new weapon system can bankrupt the national economy. Poisons, on the other hand, are cheap, and yet have the killing power of nuclear weapons, without attracting so much attention. There is no big bang, no mushroom cloud. But all the people can be removed silently and secretly, as they have all been removed from the northeastern tip of Afghanistan. And the new poisons are so bizarre that they can be denied completely, making proof extremely difficult to obtain. But any serious study of Soviet military doctrine soon demonstrates that not only is CBW defensive gear a routine part of Soviet operations, which is widely acknowledged. So is CBW aggressive gear, which is not well known at all. In Afghanistan, for instance, Soviet helicopter gunships equipped with lethal chemical agents now perform routine duties like the protection of flanks during the movement of military forces, which is a duty that used to involve sweeping operations by ground forces. This is only one of scores of examples available that show the growing dependence of the Soviet armed forces on poison weapons. Poison tactics and poison strategy have taken much of the role previously assigned to tactical nuclear weapons in Soviet doctrine. It is ridiculous to expect the Soviets to stop employing a weapon that is proving so useful. To stop using chemical weapons would require abandoning hundreds of millions of rubles worth of specialized military equipment now actively in use in the field. The sooner we realize that we have entered a new age of poison weapons, the sooner we can deal with it realistically. Obviously, at least those arms control agreements that have to do with chemical and biological poison weapons have proved to be a sham on the part of the Soviets, and the sooner we can distinguish real goals from sham, the sooner will we make strides toward genuine arms control.

Senator PRESSLER. We have a series of questions, but I think we can address them to the whole panel and hear from everybody else first, if there is no objection.

Admiral Davies, would you agree with that? We will take your statement from you. The Chair would appreciate your summarizing it, and we will put your written statement in the record. If you feel a

compelling urge to say something additional later that you forgot, we will bring you back on, but why don't you proceed.

We are glad to have you all here today. Thank you very much, all of you, for coming.

STATEMENT OF REAR ADM. THOMAS D. DAVIES, USN (RET.), POTOMAC FALLS, MD.

Admiral DAVIES. Thank you, Mr. Chairman. My statement is pretty short, but I will cut it further. We have discussed the problem here enough that my initial paragraphs could be omitted.

These events—the "yellow rain" events—have raised an important and difficult question. Can these actions be taken as an indicator of likely U.S.S.R. conduct as a signatory of the prospective CW treaty? And how are we to relate these reports to a decision to continue or not our negotiations?

To try to shed some light on this matter, I would like to recall some of the concepts of modern arms control, as well as some specifics of chemical warfare that make it a natural target for arms control.

Since the attempts at large-scale use in World War I, chemical warfare has a long history of nonuse. There have been occasional reports of use against some primitive and unprepared people—parallels to the current reports previously mentioned. There is also the case of Italian use in Ethiopia during World War II.

In my opinion, the nonuse, notably in World War II—other than the Italian one I mentioned—of CW stems from the fact that it is an inefficient weapon of war when compared to the many conventional alternative weapons. Most nations' inventory of chemical stocks are justified on the grounds of deterrence. These characteristics make CW a likely subject for an effective arms control agreements.

Although the great powers proposed and signed the Geneva Protocol on CW and BW in 1925, that document is largely hortatory and, as one might expect, does not seem to have constrained the great power signatories, who have maintained massive stocks of chemical warfare agents and chemical "corps" for their employment, although they have asserted in that document that they will not use them in war.

The modern concept of arms control stands in distinct contrast to the Geneva Protocol. The most fundamental difference is that the treaty's effect is the actual elimination of physical stocks of weapons so that their use in war is prevented by their nonexistence. The physical elimination of stocks demands the ability to verify the parties' actions, since the effectiveness of such agreements has a major impact on national security and, thus, the participants cannot depend only on trust.

The increased effectiveness of such agreements adds to the motivation to sign in the first place and to comply with the provisions—that is, to keep the agreement in effect—since by this means each party ensures the nonexistence of the other's weapons. Without this mutuality of benefit, the agreement could not have been constructed initially and certainly would not endure. Both parties must perceive their interests as being enhanced by the arrangement. Obviously, both parties should be interested in having provisions which improve verification or make it easier.

These reports of chemical use in Afghanistan and Kampuchea raise many emotional issues. However, they are not, in my opinion, a basis for cancelling our CW negotiations. In one sense, they demonstrate the sensitivity of our verification ability in turning up possible use of chemical agents even in remote areas such as these.

They also reemphasize the need for adequate verification provisions and a carefully drawn agreement. I believe that such an agreement can be constructed, that elimination of chemical agents can result, and that this will provide sufficient motivation for the U.S.S.R., as well as the United States, to enter into such an arrangement and to abide by its terms.

This concludes my prepared statement, Mr. Chairman, and I will be glad to answer any questions that are brought up.

[Admiral Davies' prepared statement follows:]

PREPARED STATEMENT OF REAR ADMIRAL THOMAS D. DAVIES, USN (RET.)

Mr. Chairman, I am pleased to have this opportunity to discuss the currently dormant negotiations between the United States and the U.S.S.R. in the matter of a Chemical Warfare Ban. For some time now there have been reports of the use of chemical weapons in Afghanistan by the U.S.S.R., a signatory of the Geneva Protocol, and in Kampuchea by a client state of the U.S.S.R.-Vietnam. The United States has been greatly concerned over these, and has persuaded the U.N. to conduct an investigation, although this has not been productive of any results. The Department of State has issued and updated a White Paper on the subject.

These events have raised an important and difficult question. Can these actions be taken as an indicator of likely U.S.S.R. conduct as a signatory of the prospective CW treaty? How are we to relate these reports to a decision to continue of not, or negotiations?

To try to shed some light on this matter I would like to recall some of the concepts of modern arms control, as well as some specifics of Chemical Warfare that make it a natural target for arms control. Since the attempts at large-scale use in World War I, Chemical Warfare has a long history of non-use. There have been occasional reports of use against some primitive and unprepared peoples—parallels to the current reports previously mentioned. In my opinion the non-use (notably in World War II) of CW stems from the fact that it is an inefficient weapon of war when compared to the many conventional alternative weapons. Most nations' inventory of chemical stocks are justified on the grounds of deterrence. These characteristics make CW a likely subject for an effective arms control agreement.

Although the great powers proposed and signed the Geneva Protocol on CW and BW in 1925, that document is largely hortatory and as one might expect does not seem to have constrained the great power signatories—who have maintained massive stocks of chemical warfare agents and chemical "corps" for their employment, although they have asserted that they will not use them in war.

The modern concept of arms control stands in distinct contrast to the Geneva Protocol. The most fundamental difference is that the treaty's effect is the actual elimination of physical stocks of weapons so that their use in war is prevented by their nonexistence. The physical elimination of stocks demands the ability to verify the parties actions—since the effectiveness of such agreements has a major impact on national security and thus, the participants cannot depend only on "trust."

The increased effectiveness of such agreements adds to the motivation to sign in the first place and to comply with the provisions—i.e., keep the agreement in effect—since by this means each party ensures the "non-existence" of the other weapons. Without this mutuality of benefit the agreement could not have been constructed initially and certainly would not endure. Both parties must perceive their interests as being enhanced by the arrangement. Obviously, both parties should be interested in having provisions which improve verification or make it easier.

These reports of chemical use in Afghanistan and Kampuchea raise many emotional issues, however, they are not in my opinion a basis for canceling our CW negotiations. In one sense they demonstrate the sensitivity of our verification ability in turning up possible use of chemical agents even in remote areas such as these. They also re-emphasize the need for adequate verification provisions and a carefully drawn agreement. I believe that such an agreement can be constructed, that elimination of chemical agents can result, and that this will provide sufficient motivation for the U.S.S.R. as well as the United States to enter into such an arrangement, and to abide by its terms.

This concludes my prepared statement, Mr. Chairman. I will be glad to answer any questions that the members may have.

Senator PRESSLER. We thank you very much. We will now hear from Ambassador Leonard, and we thank you for being here.

STATEMENT OF HON. JAMES F. LEONARD, CHAIRMAN OF THE BOARD OF THE COMMITTEE FOR NATIONAL SECURITY, FORMER U.S. REPRESENTATIVE TO THE COMMITTEE ON DISARMAMENT, WASHINGTON, D.C.

Ambassador LEONARD. Thank you. It is an honor for me to be here, sir. I would like to make four points to this committee, Mr. Chairman. These are the four points on the first page of my prepared statement, and then I would be glad to answer any questions of the committee.

The first point is that although the administration has assembled a substantial body of material to support its charge that the Soviets and the Vietnamese are using prohibited agents of chemical and perhaps biological warfare in Laos and Cambodia, this evidence, I say with regret, still does not prove the charges beyond a reasonable doubt. The evidence regarding Afghanistan appears to me somewhat stronger but still, I am afraid, somewhat less than conclusive.

For me, Mr. Chairman, this is an extremely unsatisfactory and disturbing situation, and I would like to offer two suggestions to the committee of what might be done within your frame of reference on that.

The first, Mr. Chairman, would be to urge the administration and, in the event that urging is not successful, then on your own, to arrange for the establishment of a small, multidisciplinary group of scientists from different disciplines, established figures outside the Government and having no reason to tilt toward either confirming or disproving the administration's case on this, and ask them to examine the evidence as it stands and either draw conclusions from it, if they feel the evidence will support those conclusions, or if they feel there is insufficient evidence, then to design and recommend to you the kind of a further study which would provide that conclusive judgment on the case.

The second suggestion relates to evidence which has to be necessarily handled in a different way—classified evidence. There is quite a bit of it, and I have not had access and do not wish access to any of that. I have given up all the clearances I ever had. But this evidence is apparently quite convincing to many people who have examined it, and I would urge that the staff of this committee who do have clearances arrange for access to it, examine it, and then make a recommendation to you based on their examination of that classified material.

So much for my points, Mr. Chairman, for the case as to whether prohibited agents are being or have been used.

I would like to go on to the second and perhaps more important area, and that is the implications for arms control negotiations. Here I find myself in agreement with the position that has been put forward to you by Secretary Eagleburger, as well as just now by Admiral Davies, which is that it is desirable to press forward in negotiations aimed at new agreements.

I do not think I have expressed it as well as Secretary Eagleburger did in his prepared statement, and I would simply endorse that.

I would go beyond that, however, to urge that there is a way in which our negotiators can translate this desire for an agreement, which I believe is sincere on their part, more effectively into action, and that is to indicate to the Soviet Union and to the world at large a willingness to reopen the bilateral negotiations which were terminated—suspended I think perhaps is a better word—quite a while ago, and to do this without conditions.

The administration position, as indicated in the text Secretary Eagleburger just read and as Ambassador Field has said in Geneva, is a willingness to reopen bilateral negotiations with the Soviets, but conditional on the Soviets demonstrating—not merely professing but demonstrating—a sincere interest in reaching a satisfactory agreement.

I simply do not think there is such a thing as a demonstration, apart from the willingness to engage in serious negotiations, and whether they are willing or not can only be found out if we press forward in the only way that has ever produced any significant agreements with the Soviet Union, and that is in private bilateral explorations, followed up, of course, and paralleled by open and multilateral discussions of the same issue.

Finally, Mr. Chairman, I would like to urge that serious attention be given to an alternative approach which would complement, not replace, the approach the administration is following in going for a global agreement. This would be the approach of trying to negotiate a chemical weapon-free zone in Central Europe. I think that it is clear on looking at the possibility that such an approach could be negotiated a great deal more quickly and could be verified a great deal more readily than the global approach that the administration has, for good reason, been following for a good many years, over a decade now.

And I, therefore, recommend that this be given serious consideration.

Thank you, Mr. Chairman.

[Ambassador Leonard's prepared statement follows:]

PREPARED STATEMENT OF HON. JAMES F. LEONARD

Mr. Chairman, it is an honor for me to appear before you today. I do so as a private citizen, representing no one but myself.

I would like to make four points to this Committee today:

1. Although the Administration has assembled a substantial body of material to support its charge that the Soviets and the Vietnamese are using prohibited agents of chemical and perhaps biological warfare in Laos and Cambodia, this evidence still does not prove the charges beyond a reasonable doubt. The evidence regarding Afghanistan appears to me somewhat stronger but still not conclusive.

2. This is an extremely unsatisfactory and disturbing situation, and I will suggest some possible lines of action to the Committee.

3. Even if one assumes that the Administration's charges are correct, it remains desirable to press forward with negotiations aimed at new agreements in the CBW area. The Administration agrees with this viewpoint but I will

offer a comment on how our negotiators could more effectively translate this attitude into concrete action.

4. In particular, I want to urge that serious attention be given to an alternative approach to the problem of chemical weapons: a chemical-weapon-free zone in Central Europe, such an approach could likely be negotiated more quickly and verified more readily than the global approach we have been following for more than ten years.

With your permission, Mr. Chairman, I will comment briefly on each of these four points.

Why do I still find the evidence regarding "yellow rain" less than totally convincing? First, a great deal of the evidence consists of statements by refugees that a plane flew over their village, a colored substance then appeared on the ground and on vegetation, people then got sick. I do not doubt any of these elements, but what is the precise connection between them? I believe all will acknowledge that there are too many variations in the details and in the way they are related for any rigorous conclusion to be drawn from the refugee reports alone, including the medical examinations which have been given them after their difficult travels out into Thailand. There is not a clear enough pattern to point strongly to any known CBW agent.

Recognizing this the Administration (and your witnesses) have suggested a hitherto unknown CW agent: mycotoxins. They may be right. Reputable scientists and doctors have testified that they are satisfied with the mycotoxin hypothesis. But other reputable scientists have raised questions about one or another aspect of the evidence supporting this hypothesis and I do not feel that these questions have been dealt with in the serious and careful manner that is appropriate. I can see no reason why an independent panel of experts has not been assembled and asked to address this question of whether the medical evidence points with very high probability to mycotoxin poisoning or whether alternative explanations appear possible.

Finally, there is a question of whether mycotoxin poisoning, if established, could derive only from the dissemination of mycotoxins by man, as charged, or could derive from some natural process, as in earlier known cases noted in the State Department report of March 22, 1982. Here, of course, it is important to consider the samples of leaves, scrapings, etc. from the areas which are reported as being attacked, as well as blood samples from victims. As reported in the two State Department documents, these indicate the presence of mycotoxins in a suspicious number, though not all, of the samples. I believe this collection and research effort has been totally honest. I do not for a moment question the provenance of these samples or the laboratory analyses of them. No one is "salting" them with mycotoxins. But this chain of evidence does not lead inexorably to a conclusion that mycotoxins are being disseminated as a CBW agent. There simply has not been a sufficiently widespread and thorough examination of alternative explanations for their presence in these samples.

This, then is my first suggestion to you. I urge that you arrange for a small, multidisciplinary group of established scientists, outside the government and having no reason to tilt toward either proving or disproving the Administration's case, to examine the evidence and either draw conclusions or design a broader study if one is needed.

My second suggestion relates to another class of evidence, all of it classified. I no longer have any clearances and none of this classified evidence has been shown or described to me, I believe, however, that it is quite convincing to many of those who have studied it. I suggest, Mr. Chairman, that you arrange for several of the Committee staff, who do have the clearances, to examine it and report to you. A word of caution, however: the interpretation of this classified material is an art, not a science. Your staff will want to keep in mind here also the possibility of alternative explanations for evidence which at first glance seems to point clearly to a single conclusion.

There is one more puzzling aspect to the Administration charges. Only for Afghanistan can one construct a coherent military and political rationale for the use of CBW. There the situation is a classic example of the sort of circumstances in which, ever since World War I, an unprincipled and relatively advanced government has come in conflict with backward, unruly tribesmen and has resorted to gas. In fact the first use of CW after World War I was, I have read, by the British in Afghanistan to pacify the tribes along the frontier. (I hasten to add that this was before the negotiation of the Geneva Protocol.) The Soviets are in Afghanistan, where they have no business whatsoever, they are meeting intense resistance from the Afghan population, and their armor and infantry has a very

hard time pursuing guerrillas into the mountains. The intensive use of tear gas, especially in tunnels and caves, could have been an easy decision for the Soviet commanders, and it would not be surprising if they then resorted to stronger incapacitating agents, which are sometimes fatal, as well as to incendiaries, which are ugly weapons but are not prohibited by the Geneva Protocol. Have they been crossing the line into lethal agents? The Administration has concluded that they have. I am not so certain, but it appears to me somewhat more likely than in Southeast Asia.

It is much more difficult to construct a military and political rationale for the use of lethal agents in Laos and Cambodia. The Vietnamese army is in effective control of all of Laos and of all of Cambodia except for small enclaves along the western border. The only significant military problem in either country comes from the forces of Pol Pot along the Thai border, and that is critically dependent on their ability to retreat when hard pressed back into Thailand, where the Vietnamese forces have generally refrained from "hot pursuit." Neither the foreign community in Phnom Penh nor foreign observers in Thailand give much credit to Pol Pot's claims of military operations deep into Cambodia, though small groups doubtless do penetrate and carry on scattered small attacks. The Vietnamese thus do not really need or have much use for CBW against their enemies in Cambodia.

In Laos there seems to be no coherent resistance to the Vietnamese although their forces no doubt do encounter problems in some remote tribal areas.

The Vietnamese thus do not face in either of their "protectorates" the kind of military situation which the Soviets face in Afghanistan. A campaign featuring the use of prohibited agents therefore makes no military or political sense. Nor do the effects of mycotoxins as described in the State Department reports appear militarily useful. The symptoms seem to appear only hours or even days after the exposure and they seem to be often merely harassing or disabling rather than rapid and fatal. (These characteristics make their use in Afghanistan appear quite unlikely.) If the object in Laos were, as is sometimes suggested, to drive the H'Mong down out of the hills, one would think that the Vietnamese could do so more effectively at lower political cost by using tear gas or sowing mines in the H'Mong villages and using herbicides on their crops. It is also difficult to reconcile this theory with the accounts of yellow rain being sprayed on H'Mong villages which are in the lowlands and under the control of the Lao government.

In sum, the use of lethal CBW in Laos and Cambodia simply does not make sense. It does not fit well with our experience in Vietnam where we found the Vietnamese a ruthless but very pragmatic adversary.

Turning to the negotiations on CW now, going on in Geneva, I have studied the texts tabled by the U.S. Delegation and I find them generally on the right track. One may presume, however, that our proposals are a basis for negotiation, not a take-it-or-leave-it proposition. How can we move those negotiations forward?

There is only one country in the world which presently has a CBW establishment that could cause us any real concern; it is, of course, the Soviet Union. Progress on any meaningful agreement requires serious negotiation with the Soviets. From 1977 to 1980 this negotiation was carried forward in Geneva on a confidential, bilateral basis, along with the open multilateral talks in the Disarmament Committee itself. Progress was made, though not enough. But the present Administration has declined to renew these bilateral talks.

The Soviets say that this shows we are not serious. They allege that our charges on yellow rain are a smokescreen to cover our lack of sincerity and that our proposals are just another smokescreen. Other governments are unfortunately somewhat impressed by this Soviet line. Far from resenting the idea of U.S. bilaterals with the Soviets, they would be pleased if we renewed them. Our allies would, of course, expect to be kept informed and there should be periodic reports to the full Committee, but everyone recognizes that bilaterals facilitate the kind of frank give-and-take which could quickly deteriorate into polemics if conducted in front of an audience.

What should be done to make it clear that we are serious? The Secretary of State (not a subordinate) should call in the Soviet Ambassador and should explain to him that even though we are disturbed by what seems to be going on in Afghanistan, Laos, and Cambodia. The President is deadly serious about wanting an agreement on CW and we are ready to hear their comments on our proposals or their counterproposals in any form or channel they prefer. He should say that he has instructed Ambassador Hartman to deliver the same message to the Soviet Foreign Minister and that Ambassador Fields in Geneva

will be calling on the Soviet Ambassador there to offer to renew the bilateral talks if that is their desire.

These simple procedural steps would not in themselves ensure a successful negotiation, or even substantial progress toward an agreement. They would, however, transform the sour atmosphere in Geneva and they would gain for our proposals the kind of serious consideration, both in Moscow and in other capitals, that they are not likely to get under current circumstances.

My final suggestion, Mr. Chairman, relates to the possibility of a short-cut to a meaningful CW agreement. For a decade and more we have pursued the objective of a global, world-wide treaty leading to the total elimination of chemical weapons from the arsenals of all states. We should not abandon or in any way slacken that effort. It should be possible, however, to pursue simultaneously—in parallel—a new objective: the elimination of chemical weapons from the only place on earth where two hostile CW deployments confront each other, that is, in Central Europe. All stocks of CW, as well as means of delivery, would be withdrawn from a zone of specified width on both sides of the East-West dividing line. Appropriate measures would be agreed to verify that everything had been withdrawn and to deter any clandestine reintroduction of CW. I do not suggest that this sort of agreement could be negotiated over a weekend and carried out over the following week; but it is self-evident that the negotiating process, the design of necessary verification measures, and the full execution could all be much simpler and more rapid than the negotiations for an agreement which covered, ,for example, only East Germany and Czechoslovakia for a global agreement which would have to make us confident that there were no longer any chemical weapons or production facilities anywhere in Eastern Europe or in the vast reaches of the U.S.S.R. itself.

An agreement of these lines has been strongly recommended by an international commission on disarmament chaired by Mr. Olof Palme, the Prime Minister of Sweden, and comprising senior political figures from East and West, including former Secretary Vance from the United States. The concept deserves to be taken seriously.

Senator PRESSLER. Thank you. Let me say that I know there are diverse views on the use of "yellow rain." I will keep the record open for a few days to consider additional statements of controversy and additional written statements if any body in the audience wishes to submit a statement.

That does not mean we will put it in the record. We will consider putting it in the record if the staff feels it sheds new light, because although the Government of the United States has concluded that "yellow rain" is being used, and although I have concluded that, we do want to hear the other point of view.

We do want to hear critics of this theory or people who question it, because I think some of the suggestions that have been given by Ambassador Leonard are good in terms of really getting an independent group of scientists to look into it more. We need to continue to look into it more because there are differing schools of thought, so I make that offer that if anyone wishes to submit a short written statement with some information, because, obviously, we do not have all the witnesses here who might have liked to testify. We will consider placing them in the record, and staff will analyze them and make a recommendation to me.

First of all, Dr. Townsend and Mr. Seagrave, how do you react to Ambassador Leonard's contention that the charge of chemical weapons is unproven, and what is your assessment of Ambassador Leonard's proposal for a commission of scientists to review the evidence?

Dr. TOWNSEND. I have to confess that as a physician and having spent nearly the first 3 months of April, May and June 1981 interviewing new Hmong that had crossed the river, the Mekong, long before the title "mycotoxin" was invented as far as this subject is con-

cerned, I was totally convinced that chemicals were used. Proof? Certainly not. I have no proof at all.

I have, if you like, only that which most physicians are armed with, and that is the interrogation that goes into history taking and the cross references that they try to get to separate truth from fiction, to cut out of the pattern that which is useless or contradictory information.

I was convinced that chemicals of some types—I knew not which—were being used as early as that time, and I, frankly, was astounded to find that the Lewis Commission, I believe, in the fall of 1979 had essentially the same conclusion. But in spite of nearly 5½ to 6 years, at that time, there was still no large-scale effort undertaken by the private sector, as well as the modest one by the Government, at that time.

I am concerned that an effort by the private sector would be extremely useful, but I have a terrible misgiving that if the Government had not initiated one on their own, as modest as I consider it to be, we would not be here today hearing suggestions that the private sector become involved. They could have become involved years ago, because certainly the reports were coming out years ago.

Senator PRESSLER. Mr. Seagrave?

Mr. SEAGRAVE. Senator, I am already aware that there already exists a panel very much like that described. It has not been surfaced but I understand from people involved in the investigation in the Government that all of the material, all of the evidence, is filtered through that group before it is made public, and that includes at least one Nobel laureate.

So, perhaps that panel already exists and all that is necessary is to get that panel surfaced.

As far as the evidence is concerned, I have been involved in this for 5 or 6 years and there are always going to be a great many people that do not believe the evidence. I think it is difficult for most people to be convinced until they have had an opportunity to get better acquainted with the classified material.

Senator PRESSLER. Both of you, or all of you, are following things in Vietnam, Kampuchea, Laos and other areas. I served in the Army in Vietnam. There was a great controversy about that war and there still is.

But I understand that since the end of that war, in those countries just mentioned, there has been a holocaust as serious as any in history as a result of different types of activities.

Would that be a true statement?

Mr. SEAGRAVE. I would say that if you are talking about condensed in time, yes. It is like having all of the deaths in the Soviet Union over 50 years compressed into just 3 or 4 years, which is difficult to comprehend.

Senator PRESSLER. And how have these deaths occurred?

Mr. SEAGRAVE. Many of these deaths were very straight forward, with bombs, explosives and otherwise people being executed for things as ridiculous as wearing glasses because that indicated that they were "defiled" by contact with the West.

However, I think it is interesting in this context to realize that these murders continue. The holocaust is not over. The hill tribes we referred

to in Laos are being reduced in numbers to an extraordinary degree, and something needs to be done. And before it can be done effectively, there has to be some kind of common voice which, as you can tell from our session here, is still divergent.

Ambassador LEONARD. Could I comment on that, Mr. Chairman?

I just came back from a brief trip into Cambodia, Phnom Penh, and then around inside the country. The holocaust that you mentioned and that Mr. Seagraves described is really one of the most appalling passages in modern history.

Within a period of about 4 years, less than 4 years—the Cambodians will tell you 3 years, 8 months and x number of days, they know to the hour how long they were under this government—the regime which is known today as Democratic Kampuchea—or more popularly as the Pol Pot regime—did kill at least 1 million Cambodians out of a population of 6 or 7 million.

They killed most of them by simply cutting their throats or hitting them on the back of the head, and pushing the body into a mass grave. It was really one of the most, I think, unbelievable events.

The unfortunate—and I do not want to point at a wrong conclusion here—but one of the unfortunate elements is that it is precisely this regime, the Pol Pot regime, which has been most fertile in its charges of the use of chemical weapons on the part of the Vietnamese who invaded Cambodia—not because they hated the tyranny that the Pol Pot regime was exercising but because they were angry at the Chinese influence over Pol Pot and they feared the use of Cambodia as a kind of jumping-off ground against them.

They came in, starting in December of 1978 and on through January, February, March of 1979, and chased the Pol Pot crowd out and into the border areas along the Thai border where they remain today.

So that one has to examine—and I think the U.S. Government has examined—the evidence coming from the Democratic Kampuchea forces with the greatest of skepticism and reservation.

The best description of it is not in any U.S. Government document, it is in a Canadian report, a very heavy report—this is the document here, it is a hundred-and-some-odd pages—carried out by the Canadians. A careful epidemiological investigation of four particular charges of the use of yellow rain. It is a model of what should have been done by the U.S. Government and published by the U.S. Government.

I share Dr. Townsend's regret. He is correct in using the word "modest" to describe the effort that the U.S. Government has deployed on this question. It is regrettably modest and it should have been much larger in scale, given the gravity of the matter that we are dealing with and the very serious implications for the whole range of arms control endeavors.

Senator PRESSLER. Dr. Townsend and Mr. Seagrave, do you believe that the new coalition of resistance fighters in Kampuchea will be the target of intensified chemical warfare in the next several months?

Do you think more lethal or long-lasting chemical weapons will be used in Kampuchea or Laos?

Dr. TOWNSEND. Since it is the dry season where you normally see a seasonal variation of use, particularly within Cambodia, the attacks have continued. They have stepped up use of conventional arms along

the border. The use of chemicals has not been thus far this year as heavy along the Thai-Kampuchea border as it was last year.

The dry season still has a long time to go. We expect many more attacks to take place this year. They have shifted, they have been largely against the Khmer Serai, or known Communist Khmer resistance forces. There is a lot of speculation as to why that is but the Khmer Serai have been themselves far more vigorous in their own military activity.

The use in Laos has still continued, both within the mountainous area of Fubir and in western areas. In general, since 1979, the combination of aircraft delivery and the use of artillery and mortar has altered considerably. Since 1979, it has been nearly all aircraft delivery alone.

The frequency of high lethality that we saw back in 1977–78 has not been reported.

If I could add just one thing. We are seeing constantly reports of the very young and the very old dying first. This is to be expected. I find it very difficult to accept any specific figure as being very accurate. I know that currently the Government is using a conservative figure of perhaps 10,000 deaths. I feel that 50,000 deaths, frankly, is being very conservative over the years since 1975.

Now, many of these deaths would not occur in the first few days or hours but occur weeks thereafter, since one of the characteristics of the mycotoxins is to lower the natural immunity within the body. Of course, many of these people, malnourished as they are, are much more subject to death from many different causes, thanks to the activity of the chemical.

Senator PRESSLER. What are we talking about here? Let us get a description of how this works when they attack people with these chemicals. Do they spray them on the area with a helicopter, does a helicopter go over? Is it a visible spray? Is it something in the air that if it does not touch you, does it hurt you? And then, once you get it on yourself, what happens to you? Do you start getting sick 2 weeks after or do you fall over the next day? Does nobody know the symptoms for sure?

Dr. TOWNSEND. You have asked, of course, not one but many questions all in one.

We are seeing the use not of, we believe, one particular variety of chemicals but different combinations thereof. Of not just mycotoxins themselves but with chemical additives, if you like, which will act somewhat in the nature of surfactants which themselves do increase penetrating capacity through the skin, so that they do not all necessarily have to be inhaled.

There is protection by cover, whether it be a house—forest to some degree, but especially of house—and according to what the defectors have told me, they would often urge their own people to have a 2-meter-by-2-meter piece of plastic which, if they came under the effect of their own chemicals, they would get under and remain until their officers told them to move.

The effect is multiple. This is one of the tactical advantages of the mycotoxins, if you like. They mimic such a broad area of the natural diseases found in the tropical zones.

The symptoms cover essentially every aspect or every system within the body—the central nervous system, the respiratory, the intestinal

system. Sometimes the skin, sometimes the eyes, the ears. Some of these may have symptoms lasting just a matter of a few hours. For others—and I have heard this on more than one occasion—symptoms lasting for years or more in people who look entirely normal.

Senator PRESSLER. Do the people who come out of there, the refugees, do they know about this yellow rain? Is it something that the entire population knows about or is it just something that we know about?

I mean, the common man in Kampuchea, Laos, and Vietnam, is it something people talk about or do they not know anything about it?

Dr. TOWNSEND. Within Laos, and including the relatively primitive Hmong, yellow rain is a far more familiar subject than it is here within the United States.

Senator PRESSLER. I see.

Mr. Leonard, in your recent travels to Southeast Asia, including Thailand and Vietnam, did you raise the issue of yellow rain with both Governments? What is their assessment or explanation of the evidence?

The Vietnamese have not cooperated, as I understand, with the U.N.'s investigation. What is their explanation? What approach do they take?

Ambassador LEONARD. Yes, Mr. Chairman, I did raise it, both with the Foreign Minister of Vietnam and with other officials at a lower level. I got the answer I expected which was a flat "stonewall" rejection of all the charges as being ridiculous.

Perhaps the only interesting element in the response that we were given was the comment on the Foreign Minister's part that this was an illogical thing because the areas in which these weapons are alleged to have been used are "our areas and therefore we would not want to be messing them up the way you Americans did in Vietnam where there was a lot of stuff like agent orange and so on."

Well, of course a state of mind that looks on Laos and Cambodia as "our areas" is one that is rather difficult to work with in political terms because they are supposedly sovereign states.

I did not take it up in Cambodia with the officials there. Frankly, there was no use. The Cambodian Government—if one wants to call it that—has nothing really serious to do with the military activities upon the border. If it has any role, it is that of guarding bridges and stuff in the rear areas.

But the Vietnamese Army is what is carrying out the military campaigns against the resistance forces in the border area.

Dr. TOWNSEND. Mr. Chairman, if I could add just a few comments that I think would fit very neatly into what has just been said, particularly the response by the leadership within Hanoi.

We have noticed, in the last year or so, an increasing percentage of number of complaints by people coming from villages that we would normally consider to be under the control of the Pathet and Lao Vietnamese forces, villages having been hit.

This intrigued us. It did not seem particularly likely or possible, or probable at first. But it has been repeated several times over. We would also hear comments to the effect that there would be several occasions where the troops—either Pathet Lao or Vietnamese—would enter the villages anywhere from 4 to 8 days following use of the

chemicals and assess the numbers of deaths and illness within these villages.

I found it difficult to accept and handle, frankly. But when pressed, there is no other conclusion that I could make but that they were using these people essentially as guinea pigs within their own setting. I think it speaks for itself.

Senator PRESSLER. If I might ask Admiral Davies, how are we going to get ahold of this matter, how can we get to the bottom of this? How can we get an international organization like the United Nations or somebody who is going to do something about it and remove the doubt in some people's minds?

Admiral DAVIES. Well, you are talking about running out the facts on the thing. As to that, I think we have to do the sort of thing that Jim Leonard was talking about. We have to get a commission set up to review these carefully.

I am not privy to the confidential information or classified information of the last 2 years, as I was earlier. I advocated the same thing at that time, that we knew very little about this. There is a vast amount of ignorance in this country, in our medical circles, about the mycotoxins and how they work, and so on.

I said, let us get somebody on this. We were not able to do that. But that seems to me to be the approach.

As far as the arms-control aspects of it, I think that is a matter of resuming the now dormant bilateral negotiations, as I recommended here.

I think that there is another matter entirely and that is a matter of now using this experience to draw some very careful provisions for verification—which incidentally is not going to be easy but I think it can be done. Verification was where we fell apart the last time with the Soviets. It is a very real problem but I think it can be licked if we persist.

Senator PRESSLER. Mr. Seagrave, we understand that you recently met with some officials of France. What is their view, and do you know what the French Government plans to do with its findings?

Mr. SEAGRAVE. I am told by senior French generals that they are going to release this material in April in a presentation to the United Nations.

I presume that that will have some influence on the future handling of the matter. It is a little bit hard to say at this point but we have the United States, Canada, and, forthcoming, France. I should think it might be fruitful if the United States were to try to bring the various countries together that have said privately that they have evidence to support this.

That already is well over 13 countries, that should make quite a bit of an impact.

Senator PRESSLER. With regard to verification, it seems strange that we cannot pin this down better although we do have substantial evidence. But I know that the earth resources satellite has taken photographs of farm ground around my home in Humboldt, S. Dak. You can see a small airplane flying or a car moving, from a satellite picture.

Why can they not take a picture of the areas that have been spread with yellow rain? For example, a field of corn that has been sprayed

for weeds shows up differently on a satellite picture from one that is not.

Mr. SEAGRAVE. They have a great many satellite images which are very revealing. I have seen only one myself and that shows very clearly Soviet soldiers passing through a three-tent decontamination system way up in the mountains of Afghanistan were something like that would not be taken unless it was operational use.

However, I understand that the reason for not revealing those images is because the Government would like to keep secret the clarity of the pictures.

Senator PRESSLER. Why is there not an international outrage at this? For example, the peace movement in Europe, why are they not out marching on the streets about this?

Mr. SEAGRAVE. I think it is conditioning by the press. I think the press pushes the fear of nuclear weapons and the press has not gotten a handle on chemical and biological weapons yet. When that time comes, I think you will see the situation change.

Ambassador LEONARD. I could offer one comment on that.

Senator PRESSLER. Go ahead.

Ambassador LEONARD. I think that the manner in which the initial presentations were made by the administration was not the best. They rushed forward with evidence when that evidence had not accumulated to the point at which it should have been accumulated before they went public with it.

I think that resulted in mistrust. There is already an unfortunate level of mistrust and criticism of the United States in the whole area of arms control and security policy. That was exaggerated by the particular handling of this issue.

I must say, I think that developments since then have gone a long way toward correcting that. The best evidence I know is the votes that have been taken in the United Nations, in particular those last December, which showed, as Mr. Eagleburger pointed out, that there is a very solid Third World majority that is concerned about these things and wants to get something done about them.

Senator PRESSLER. A few weeks ago, Vice President Bush announced that the United States would introduce a draft Chemical Weapons Treaty at the Committee on Disarmament in Geneva.

That draft treaty calls for the destruction of all chemical weapons and production facilities, and a system of onsite inspection including the right to inspect on challenge.

What is your view of this proposal? If you agree with the concept, please explain. If you disagree, please describe the arrangements that you believe are required for banning chemical weapons; and, do you believe that a chemical weapons ban is in the national interest of the United States?

That is about a four-part question. Does anybody want to tackle that?

Admiral DAVIES. I might start because that sounds like the treaty that we were trying to negotiate a few years ago and then broke off at the end of the last administration.

Senator PRESSLER. They are picking up the pieces and starting up where you left off, maybe with new language.

Admiral DAVIES. I note, however, that it is in the multilateral forum there, the CD. Actually, I think the important area is the concurrent bilaterals which are the things that were dropped.

The multilateral negotiations have continued in the CD. They are notably unproductive by themselves. You must have bilateral private negotiations between the United States and the U.S.S.R. if we are going to get anywhere on it. That is the thing that we have not done yet and I think we do need to take that up again.

Senator PRESSLER. Many critics of the evidence reported thus far claim that there is no "smoking gun" which would convince the skeptics once and for all.

Some have suggested that additional physical evidence is required, such as chemical weapons canisters or more recent scrapings from vegetation.

Mr. Seagrave, in your opinion, does the evidence so far constitute a "smoking gun?" And Dr. Townsend—or both of you—do you both think that the reluctance on the part of some voluntary agencies and governments to be more active in locating and analyzing evidence can be attributed to the absence of a "smoking gun?"

Mr. SEAGRAVE. Let me say that I think the "smoking gun" exists, it is on hand, but there are a lot of people who will not believe it until they see it going off.

I think that that corner will be turned only when there are television cameras pointed at the victims when the poison hits them.

At the present time all that you really have is evidence that you can believe once you have studied it closely. It does require a lot of homework and that homework is not normally done.

So, once you look at it, you realize the "smoking gun" is in hand. But you have to look at it first.

Admiral DAVIES. I would like to just amplify that for a second. As Jim Leonard pointed out earlier, I think we were premature when we started this several years ago and there was not anywhere near as much evidence of a "smoking gun" then as there is now.

That, in a sense, destroyed our credibility. I think we were a little premature on this and so it has been hard to come back from.

Ambassador LEONARD. Mr. Chairman, could I add the comment that I am not as pessimistic as Mr. Seagrave about the willingness of an informed public to reach a firm conclusion on this when the evidence is really fairly presented to them.

But it is complicated. As he says, it requires considerable study and even a certain level of scientific knowledge—more than I personally possess.

And for those of us who do not possess it, the best substitute for that is the authoritative judgment of respected scientists, people who are known to be outstanding figures in their field.

That is why I have urged that this evidence—whether it is a "smoking gun" or not—be looked at very carefully by people whose reputation for impartiality and for caution and not rushing to judgments, is absolutely beyond question and who therefore will be respected by people like myself if they come down with a flat statement on this matter.

Senator PRESSLER. Having been a lawyer at one time, it seems odd to me that we cannot come up with the ultimate evidence, a canister or an actual bomb, or capsule of some sort.

Why can we not infiltrate these villages and get a canister of these agents? Why can we not recover some actual primary evidence within the next 12 months? We have been at this now for several years.

I presume that our intelligence agents and our great CIA is capable of infiltrating these villages. We send people out, I hope—or I am told we are spending money on investigations.

But why can we not recover a canister of the substances or an empty canister, or something.

Dr. TOWNSEND. Sir, there are a number of attempts going on. A weapon of Russian origin passed through my hands about 4 weeks ago. I expect there will be others appearing on the scene.

I was dubious that this was a chemical weapon. I have as yet to hear the final result. However, I have repeatedly heard from the Vietnamese defectors that only trusted North Vietnamese are used to guard the depots of the chemicals themselves in very select sites.

So, when I hear that the chemicals are brought by Lao, as an example, out of Laos, then I am extremely dubious that I am going to be seeing a chemical weapon result.

Yes; we would all like to see weapons such as might appear. However, if I could add a note here to questions that have been raised repeatedly by the press within Bangkok, as an example.

Back when I was in my Air Force career I briefly took care of the Russian pilot who flew the Fox Bat out of Vladivostok to Japan. If I understand correctly, he received a goodly sum for that—which was worth many times over that as far as Uncle Sam was concerned.

I am unaware that this sort of offer has ever been made. In a way I am disturbed by this—perhaps it is now considered "crass commercialism" or something to make this sort of offer.

Senator PRESSLER. We should assume, say, that we are going to pay $10,000 to who brings one out? Of course, maybe somebody then would create one or something like that.

Dr. TOWNSEND. I have been told by the PAVN that approximately two-thirds of their troops would prefer—that is in Cambodia—would prefer to go home or, if they thought they would be received by a potential third country asylum, they would break for the border without their weapons.

Now, if we ever really wanted to sow problems for the occupying forces within Cambodia, I would suggest we might offer not only asylum but perhaps, if they brought chemical weapons with them, appropriate fees. I suspect we would have everything that we have been looking for.

Mr. SEAGRAVE. Senator, at this point the only standing offer is an offer of $100,000 reward from Soldier of Fortune magazine. I do not know how that is received on the other side, but it is an offer for a fully equipped airplane, with chemical weapons and pilot.

I think that back during the Vietnam war, there was a different state of mind. Central Intelligence Agency agents and also newsmen crossed borders frivolously at that time. They do not do that any more, at least not in Southeast Asia. The CIA seems to have a lot of operations going in Afghanistan but precious few in the Indochina region.

There are very few people going back and forth across the border, trying to free MIA's. They sometimes get caught. But there has been

no major concerted effort so far as I know, aside from an Australian woman journalist who managed to bring out a canister.

Ambassador LEONARD. May I offer a comment on that? I would like to make two distinctions here. One is between a weapon, a "smoking gun" which is the weapon used to launch a chemical shell or whatever, and the weapon which actually delivers it, that is the shell or the canister, or whatever, that carries it to the target.

I think it is asking a lot to hope that we will get the gun from which it is fired; or the empty shell casing that projected it on its path; or the airplane that carried it and dropped it.

But if the delivery mode is, as is suggested, by artillery against entrenched opponents or by canisters which are dropped from an airplane and then explode when they get close to the ground—in the case of air delivery of these chemicals—then it is not unreasonable to hope that a fragment containing substantial amounts of the agent will come into the hands of the foreign governments, the United States or some other government, at a fairly early date.

This is particularly the case in Cambodia where all of the alleged sites of this activity are within a few kilometers of the border. That is an extremely porous border.

I was struck, walking through the market in Phnom Penh, at the array of goods on display there, many of them with the Bangkok price tags still on them. Everyone that we talked to in the foreign community in Phnom Penh describes this steady traffic, quite open traffic, back and forth over the borders to supply things which are simply absent and not produced in Cambodia today.

I would be surprised if the same situation did not obtain in the bazaars up in Laos. I think that apart from the refugees who come out because they cannot stand it any more in those countries or because they are fleeing military service, or whatever, there is a fair number of merchants who go back and forth.

I think the word is out very widely that a number of governments—particularly ours—would be very interested in materials that bear on this problem.

So, I think that it is quite likely that something will come in.

Now, if I may make, Mr. Chairman, just a second distinction that I think is important to keep in mind here, and that is the distinction between chemicals as a class and prohibited agents of chemical warfare.

That distinction is not adequately maintained in the discussion of this subject. Dr. Townsend said that he became convinced a long time ago that chemicals were being used against the Lao. I also reached that conclusion a long time ago.

What I was unable to conclude was that lethal chemical agents, agents which are clearly, in the interpretation put on the Geneva Protocol by the U.S. Government, prohibited by the Geneva Protocol.

That is a more difficult conclusion, as is the conclusion that biological agents in the sense of toxins which are prohibited by the Biological Weapons Convention, have been used.

Those conclusions are not reached so readily as the simple conclusion that some form of chemical weapon—teargas, harassing agents of other kinds, smoke for example, incendiaries, all of which are more or less ugly weapons but which may or may not be—depending on the

viewpoint of the government concerned—prohibited as agents of warfare. That those have been used or have not been is another question.

Mr. SEAGRAVE. Senator, if I may add another point. The material as it is used in Laos is not always or frequently delivered in a canister of the type that could be picked up. It is more often than not sprayed from the aircraft or done with air-burst bags. So, as a consequence, the H'Mong hill tribes are able to go in and bring out powder which they scrape together, or samples with powder on them. But they are not able to bring out hardware.

In the case of Afghanistan, it is extremely difficult to get the Afghans to understand what it is that we are so upset about. They do not distinguish between the use of poisons and the use of other weapons. So, when they mention to someone that there is an unexploded canister within a few clicks of the border and the U.S. consul or whoever asks them to go back and get that canister and bring it out, it is very difficult to convince them that this makes any sense.

Dr. TOWNSEND. Can I add one more observation to your ruminations about why the CIA or any other group has not uncovered this?

I can recall, since I was on duty here in the Washington area, reading in the Post and Star news about—small articles—about complaints by the Hmong that chemicals were in use against them.

I never recall seeing any comment by the Government during those years and I was a little curious. But I made two assumptions. The intelligence people had picked up the chemicals and found either, one, that there was nothing there or, two, that there was something there but for good reasons were sitting on it. And then, to my shock when I was approached by the gentleman from the Embassy back in the fall of 1980, I began to realize that we did not really know a whole lot about what is going on.

Then I began to understand why, when I got into the study, to begin with, this is a whole new family of chemicals and they are very difficult to discern clinically. I challenge any physician to recognize, without knowing the history described by the patient, or upon examination alone, that they have actually been hit with chemicals.

It has to be the combination of history, especially examination and extremely important, the laboratory exam.

Now, what few specimens had been collected between 1975 and 1979 I understand, showed nothing. Well, the laboratories were not examining for mycotoxins at that time. It was not until August of 1980. Indeed, the eight specimens that I brought out in April, May, June never came up with anything positive simply because they were not examined for mycotoxin.

This, to any operative in the field who has considerable confidence within his sources is going eventually to have his faith shaken somewhat because the laboratory keeps telling him that there is nothing there.

I suspect that the combinations of all these things, plus the political atmosphere that was present within Washington and the general antipathy toward anything related to Southeast Asia, all were related to it.

The reaction of the press in general has been an interesting one for me, having also served in Southeast Asia when we were virtually overrun by the press. I have noted only a relatively few who would bother

to leave the confines of Bangkok and do some on-site investigation among the refugee camps, or even occasionally over the border into the edge of Cambodia.

Senator PRESSLER. Gentlemen, I thank you very much. I must conclude the formal part of this hearing but we have a good number of questions that I have not been able to get to. I must go on to other duties. My schedule today because of the long Adelman hearing this morning has fallen about 3 hours behind schedule.

But I do want to thank you for your testimony. Staff will provide you right now with the additional questions which in some cases have been asked, but these are more technical aspects of them.

We thank you. This question of yellow rain is an important one for arms control and for United States-Soviet relations. I believe it is being used, but I wish we could get some primary evidence. It just seems strange to me that after all these years, and all this effort, we do not have a canister or whatever it is dropped in, or that we cannot obtain some left-over cans or empty cans. Our intelligence has to pick those up.

Of course, these are societies that are not open, but there are some people who are going in and out. I hope that my conclusion that the Biological and Chemical Weapons Agreement is being violated is not correct. But I believe from these two hearings that the Soviets are using chemical warfare.

But still, I am going to be doing some talking and urging in Government agencies. We should be able to come up with the primary evidence. We should have people infiltrated into these areas who can produce the evidence.

It is something that we must pursue. The Western countries must express outrage. The Canadians have done a great study. Third parties, independent third parties, have done excellent studies. The Peace Movement should be outraged. There should be demonstrations against this but there are not—that is a paradox and I find it disappointing.

So, we will continue to try to bring the evidence forward. If anybody in the audience has additional information about yellow rain and if the witnesses feel that they want to expand a portion of their statement, we will do that.

They have been very patient today, they were supposed to come up at 11 o'clock this morning. As you know, we did not get through the Adelman hearing until about 2:30. So, we have all had to change our schedule slightly.

I thank you very much, and I conclude this hearing.

[Additional questions and answers follow:]

ACDA'S RESPONSES TO ADDITIONAL QUESTIONS SUBMITTED FOR THE RECORD

Question 1. What is the role of ACDA in formulating and negotating CW and BW agreements?

Answer. For more than a year discussions on a comprehensive chemical weapons convention have been conducted in the Committee on Disarmament (CD) in Geneva. ACDA heads the U.S. delegation to the CD, but policy positions and negotiating strategies on all matters dealt with in the CD, including chemical weapons, are developed in conjunction with other appropriate Government agencies and offices; including the Departments of State and Defense, the Joint Chiefs of Staff, the National Security Council, and the intelligence community. In addition, representatives from the Departments of State and Defense and the Joint Chiefs of Staff participate in the CW negotiations at the CD.

On biological weapons, an agreement already exists which prohibits the development, production, stockpiling, and acquisition of biological and toxin weapons—the Biological and Toxin Weapons Convention of 1972. ACDA took a leading role in the negotiations of this agreement. In recent years, concerns have arisen over compliance with this treaty. Hence, steps intended to reduce the likelihood of future compliance concerns are being taken. The United Nations General Assembly at its recently-concluded 37th session adopted a resolution calling for a special meeting of states parties to strengthen the compliance provisions of the 1972 Biological Weapons Convention. The United States strongly supported this measure. As steps are taken to implement this resolution, ACDA will play the leading role in preparing for the U.S. participation in this confereace.

Question 2. Does the U.S. negotiator on these issues in Geneva report to ACDA?

Answer. Yes. Ambassador Louis Fields, the U.S. Representative to the Committee on Disarmament, reports to the Director of ACDA. He receives most of his backstopping from ACDA's Bureau of Multilateral Affairs.

Question 3. We understand that the Soviet Union wishes to negotiate a CW accord in a bilateral setting rather than at the Committee on Disarmament. Is this correct?

Answer. The United States and the U.S.S.R. conducted bilateral negotiations on chemical weapons from 1977 to mid-1980. The negotiations came to an impasse, primarily over certification issues, and specifically the Soviets unwillingness to accept on-site inspection. Since 1980, we have supported discussion of CW in the 40-nation Committee on Disarmament (CD) in Geneva, in the hope that multilateral efforts might succeed where bilateral efforts failed. The delegations represented in the Committee on Disarmament are particularly interested in being involved in these negotiations. In contrast to negotiations on other types of weapons, these deal with weapons which are accessible to virtually all countries and since World War I have been used primarily against Third World countries. The Soviets have given some indications that they would like to resume the bilaterals. For example, they have on a number of occasions said in the United Nations and the CD that they would like to resume all bilateral negotiations with the United States in the field of disarmament which have been "suspended," which would include the CW negotiations.

Whether the Soviets are interested, however, either in a bilateral setting or in the CD, in actually engaging in serious negotiations remains to be demonstrated. They have stated publicly on many occasions a desire for a chemical weapons convention. But when delegations at the CD have tried to elicit details from them as to the measures they believe necessary to develop an actual CW agreement, the Soviets avoid responding and are not forthcoming. Thus, it remains to be seen if they are prepared to negotiate seriously on chemical weapons. For this reason, the U.S. position is that resuming bilateral CW negotiations at this time is not a viable option.

Question 4. What is ACDA's view of negotiating a CW ban bilaterally?

Answer. With respect to concluding a ban on chemical weapons, we have repeatedly made clear both in public and private statements that the United States is prepared to consider any and all channels, including bilateral negotiations, that promise to be productive. We must have reason, however, to expect that bilateral negotiations would be productive, rather than simply a device to draw a cloak of secrecy around these vital negotiations and to forestall an effective and verifiable chemical weapons ban. Thus far, we have no reason to be optimistic about a bilateral approach. We have repeatedly stated that for such negotiations to be fruitful, the Soviet Union needs to demonstrate, rather than simply profess, that it is genuinely ready to work out and accept effective provisions to verify compliance with a CW prohibition. And, the Soviet Union must also show the United States and the rest of the world that it will abide by existing agreements in this area if meaningful progress is to be made.

The CD is the forum in which these negotiations are currently taking place. The United States has just launched a major initiative by tabling its paper on "Detailed Views" on a CW convention. Some initial informal discussions on this paper have been fruitful. It would, therefore, seem ill-advised, at the extreme, to remove these negotiations from the multilateral forum at a time when some progress might be achieved.

Question 5. Why do you believe the Soviets wish to move this issue out of the multilateral CD?

Answer. The Soviets have come under a great deal of pressure in the CD, particularly since we tabled U.S. "detailed views" on a CW convention, to be more forthcoming about their views and proposals on a convention to ban chemi-

cal weapons. A wide cross-section of the members of the CD have been seeking answers from the Soviets as to their intentions on the issues of verifications and compliance. The Soviets would probably prefer to avoid further pressure and critical questioning about this matter, particularly from so many different countries. This may well be the reason they would prefer a return to less visible bilateral negotiations.

ADMIRAL DAVIES' RESPONSES TO ADDITIONAL QUESTIONS SUBMITTED FOR THE RECORD

Question 1. Why do you believe that these incidents have received so little international attention? Do you believe, as former Secretary of State Alexander Haig alleged, that a "double standard" operates in judging United States and Soviet international behavior?

Answer. It is my opinion that the United States "went public" with it's information before it was adequately developed and supported. Our initial moves also included a massive P.R. effort to convince others of the validity of our information. My judgment is that these facts pre-disposed many of those we were trying to convince, to believe that it was a propaganda ploy. We also overstated the Sverdlovsk case, and continue to do so in at least one respect. There is a non-trivial amount of relevant evidence, some of it in the public domain, with which the Soviet explanation is consistent. Some other nations, aware of this would interpret our statements as deliberately overdone to denigrate the U.S.S.R. I believe it essential that we make statements, the wording of which is most carefully crafted to make clear that we are not prematurely jumping to conclusions.

Question 2. Does the lack of international outrage at these incidents suggest to you that the Soviet Union can break arms control treaties at will and without risk or cost?

Answer. No. As I stated in my formal statement, there is not yet an effective modern arms control agreement on this subject.

Question 3. If these allegations are true, what do these incidents suggest about the desirability of and the need for arms control negotiations with the Soviet Union?

Answer. We should exert immediate efforts to take up our now-dormant bilateral CW negotiations with the U.S.S.R. The U.S. position was and should continue to be, to require effective verification provisions.

Question 4. If these allegations are correct, what lessons do these incidents offer for the entire range of United States-Soviet foreign and defense policy issues? For instance, should the United States simply move to isolate the Soviet Union as a pariah state and have no dialogue with Moscow?

Answer. I believe that a dialogue with the U.S.S.R. is necessary under these conditions. In all of our relations we need to deal on a realistic basis with the U.S.S.R., never imputing to them "trustworthiness" or "fairness" or other adjectives used to describe human behavior. A quote from Charles de Gaulle (paraphrasing Lord Palmerston) is pertinent: "Nations do not have friends—only interests."

Question 5. At the U.N. Second Special Session on Disarmament, Soviet-Foreign Minister Gromyko indicated the Russians might allow better verification, including on-site inspection. How significant is this?

Answer. No one can know since the Soviets frequently indulge in P.R. moves. However, we should take it up in the Bilateral CW negotiations.

Question 6. Do you believe the Soviets are interested in a chemical weapons ban? Why?

Answer. Yes. They have a heavy investment in defensive measures which they could minimize or mothball with an effective CW ban. They probably believe like many U.S. military men, that CW is an inefficient weapon when compared with its conventional alternatives.

Question 7. If there were such a ban, do you believe the Soviets would live up to its provisions?

Answer. I believe that they would—as long as there were effective verification provisions.

DR. TOWNSEND'S RESPONSES TO ADDITIONAL QUESTIONS SUBMITTED FOR THE RECORD

Question 1. The Soviet Union denounced the U.S. report on chemical warfare in Southeast Asia and Afghanistan. The Soviets suggested that the illnesses and deaths do not result from man-made chemical weapons, but rather from natural mycotoxins.

In your estimation, is it possible that the illnesses and deaths in Southeast Asia and Afghanistan could have resulted from the natural occurrence of mycotoxins?

Answer. To the best of my knowledge, the large amount of morbidity and mortality attributed to mycotoxin intoxication in Laos and Kampuchea could not be due to naturally occurring mycotoxins. Although many of the toxins are present in very small amounts and aflatoxin in significant enough amounts to be considered a potential hazard over long periods of time, the mycotoxins found in the blood and tissue of alleged victims do not normally occur in hazardous amounts in SEA. No reports scientific, historical, or mythological exist in Thailand, Vietnam, Laos or Kampuchea that would indicate any past or present "out breaks" of disease remotely resembling the CBW-like episodes experienced by the H'Mong and Khmer and noted since 1975 and 1979 respectively.

Question 2. Dr. Townsend, you have been in the field for 2 years doing interviews and collecting evidence on the use of chemical weapons in Southeast Asia. During this period, there has been a considerable range of interest and attention given to the issue by media, the public and governments in the region and outside.

Could you describe for the Committee your impressions of the past and the current level of interest in the issue by the medical teams and representatives of foreign governments who operate in the region? What governments or private voluntary agencies or international organizations have been particularly helpful to you in your work? What media have shown the greatest sustained interest?

Answer. When I arrived in Thailand in December 1979, the degree of interest shown in the "Yellow Rain" issue was extremely minimal among the Voluntary Agencies (Volags) working in Thailand and within most governments, or their local representatives. Most of the Volags were non-committal or passively concerned at best, and some, particularly those whose espoused philosophies were more ethereal, ie, "salvation through a one-world" concept—no matter the resultant form or quality of life, have resisted any involvement for their organizations locally. Such Volags often made considerable efforts to operate on both sides of borders and clung to their felt need to continue "on both sides" regardless of the degree of inhumanity or modus operandi, that might be displayed in any host country.

In general among the "religious Volags," the Catholics and more fundamentalist Protestants would be supportive of the "Yellow Rain" research efforts while the "one-worlders," such as World Vision, AFSC (the Quakers), and the Mennonites where either passively resistant to the research effort or actively sought to discredit it. The latter two organizations fell into that category. Although they were largely American in their origins and support systems, I found them to be far more militant in their pacifism and far less objective than some of the European groups such as the Norwegian Refugee Council that supported refugee repatriation on the one hand while actively working in Laos as well as Thailand and with equal vigor would support resistance oriented refugees—arguing that the more "resistant" the group might be, the more they should be considered bona fide refugees rather than less so, as the "one worlders" and ICRC—U.N. agencies would portray such people.

Among the Volags supportive of the "Yellow Rain" research in varying degrees are, beside IRC, the Thai Catholic COERR, SAWS (Seventh Day Adventists), CRS (U.S. Catholic Relief Services), Tom Dooley Heritage, CAMA (Christian and Missionary Alliance), World Relief, World Relief Friendship Foundation (Moonies), Mormons, Youth with a Mission, the American Refugees Committee, the Thai Red Cross, ICMC, ICM, and MHD (German-Bavarian Catholic group). The rest of the 45 odd Volags were largely non-committal and tended to avoid those things which were either "political" or overly controversial for their greatest fear was to be thrown out of Thailand. Many Volags suffer in leadership quality from their tendency to hire young, bright, and dedicated individuals fresh out of college who, although talented are both devoid of useful experience and any historical perspective. Volags normally are of low budget and trade off experience for people willing to accept low salaries—in return for the experience gained—the refugees, of course, being the medium for such an education.

Medicin Sans Frontiere (MSF), a left wing French medical group was very antagonistic to our efforts in 1981 and early 1982 but with the advent of new leadership, fresh from experience in the Soviet shelled Afghani Mujadeen village hospitals, their people have been far more interested. However, they still, like ICRC, only wish to receive information rather than exchange it and both try to avoid visible contact with Americans involved in the Yellow Rain research.

I strongly suspect they have aided the French Government's investigation, however.

The media that have shown most interest in this work have been: The Wall Street Journal, and its Asian WSJ connection, ABC–TV, Australian TV—channel 10(?), Time-Life group, Washington Post, the "Moonie" papers, a couple of Italian papers whose names I've forgotten, "Information" a left wing Danish avant garde newspaper, a Singapore TV station, the Far Eastern Economic Review, the local correspondent for the (UK) Manchester Guardian, Reader's Digest, and a scattering of journalists, authors and TV people from the U.K., Norway, Sweden, FRG, Holland, Belgium, Japan, Malaysia, Indonesia, and Thailand. In some cases the interest was a personal thing on the part of local journalists who were interested and willing to research on their own while others were simply following directions from their organizational HQ's. Where both the organization and its local journalist had genuine interests, the better quality and more consistent articles on Yellow Rain have resulted. In general the media as I have seen it in Thailand has shown far less initiative relative to Y.R. than they did during the war in Vietnam. However, there have been a few cases where the Bangkok based journalists were squelched by the editorial policies of their papers or networks, policies generally negative to either the Yellow Rain investigation, to former Sec. of State Haig or to any American Government effort in general.

The other governments most vigorous in either covert or overt investigation into the Yellow Rain allegations have been the Canadian, Thai, French and FRG. The British, Australian, German, Swedish, Italian and Japanese efforts have been much more subdued. It has become apparent that Sweden and Norway use the ICRC to keep some of their military physicians close to both "wartime medicine experience" and in such a geographic distribution that they can act as conduits for military medical intelligence as well, a method our military medical services might do well to consider.

ICRC, the International Committee of the Red Cross, has traditionally denied seeing anything that could even remotely be related to CBW in its present SEA experience. However, this would seem to be an unfortunate lie. In October 1981 I was told by Khmer Rouge authorities that ICRC French speaking personnel had done an autopsy on one of their dead in the spring of 1980 and had sent tissue specimens to France for analysis although they had not heard of any results. In October 1982 a Swedish surgeon, Dr. Bjorn Zetterstrom (Deputy Surgeon General for Swedish Military Forces), while working within in a Swedish unit for ICRC at Khao I Dang, Thailand, informed me that he had seen several Khmer patients in March 1980 that had claimed to have been hit with CBW and who exhibited unusual signs and symptoms which puzzled them and which retrospectively "might have been due to CBW." He also admitted that an autopsy had been done then on a Khmer Rouge body by ICRC personnel but he was not familiar with the results. He stated—"After all, we had not heard of mycotoxin toxicity as a military weapon at that time"! Dr. Zetterstrom did testify before the 2d U.N. CBW investigating team but I was not present and do not know what he said to them at that time.

Question 3. Many critics of the evidence reported thus far claims that there is no "smoking gun" which would convince the skeptics once and for all. Some have suggested that additional physical evidence is required, such as a chemical weapons cannister or more recent scrapings from vegetation. Dr. Townsend, do you think the reluctance on the part of some voluntary agencies and governments to be more active in locating and analyzing evidence can be attributed to the absence of a "smoking gun?"

Answer. No, I do not think the supposed lack of a "smoking gun" has been the cause of less active and interested Volags and governments. Most of the "shy" Volags either are not involved because of political-religious philosophic differences which are felt threatened by positive Yellow Rain finds or they are just unable to live comfortably in a highly politicized environment.

The "shy" governments, on the other hand, seem to want to stay out of the way in what they perceive to be a strictly bipolar propaganda struggle between the two main super powers. They believe that silence and non-participation is the prudent course of action when the outcome of the struggle is in doubt. They display a frightened paralysis of action not unlike that seen in Europe and much of the democratic world prior to the onset of World War II. They prefer to simply pray that the storm will pass them by rather than prepare for it realistically.

However, while criticising Volags and governments for their reluctance to become involved in this highly sensitive, complex and controversial issue, it has been even more surprising to me to find a number of U.S. Government personnel in DOD, Intelligence, State Department and Congressional staffs who seem to have been less than happy that the investigation was even undertaken, let alone achieve a degree of useful success. For some it has been an embarrassment to be proven wrong and for others it complicates their assigned tasks, especially in disarmament talks.

Question 4. In order to better collect and analyze evidence on chemical warfare, what in order of priority do you need?

Answer. Thus far our approach has been more that of a fireman. To improve the investigation's quality and quantity of product it is advised that:

(*a*) A Thai civilian medical institution be assisted to the degree necessary so that they can perform work comparable in quality to that found in the USA.

(*b*) Neither the Thai military nor AFRIMS, the former United States financed SEATO Laboratory, should be involved if the best "classical medical research"—free of supposed or possible Thai or U.S. Government influence and most credible to neutral countries—is desired. The present work of AFRIMS is to valuable to risk losing in any highly visible and politically sensitive issue like Yellow Rain.

(*c*) A more thorough long range study of traditional design—epidemiologically, pathologically, and physiologically—should be established in the field preferably as a joint United States-Thai civilian medical institutional cooperative effort.

(*d*) The study mentioned in (*c*) should have a U.S. domestic coroilary to study any H'Mong or other SEA refugees, now in the United States, who have had an alleged CBW experience over the past 10 years.

(*e*) The U.S. Government should work with Thai civilian experts to develop a more complete understanding of background presence of all known SEA mycotoxins and their "normal levels."

(*f*) Basic research in USG and contracted institutions, should be mounting a complementary effort on the short and long range effects of mycotoxins—with and without additives to crude mixtures as well as pure agents on animals whose biological systems most closely resemble the human's.

(*g*) As complete a data bank as possible on CBW exposures in SEA, Afghanistan and any other country such as Eritrea where CBW has allegedly been used over the past 10 years should be developed—if it does not now exist. Only in this fashion can teratogenic and mutagenic effects of mycotoxins also be adequately studied.

(*h*) Basic and applied research on personnel protection equipment, antidotes and therapy are needed.

(*i*) In the field a more balanced staff, than now present, is recommended. It would be appropriate if such staffs could be jointly Thai and United States—with an open invitation to other countries interested in such a joint study. (It should be understood that some of the above is currently taking place and a further expansion of the investigation is anticipated.)

(*j*) It is urged that the word be put out that the USG would pay for bona fide Soviet CBW weapons with both a modest fee for service plus a U.S. asylum for those who bring them. This worked with the MIG 25. This should be a priority item for it is my understanding that Soviet CBW weapons in SEA are closely guarded only by picked North VietNamese troops.

Question 5. Dr. Townsend, would you give your views of the U.N. investigating team's effort and what you see as its shortcomings?

Answer. The initial U.N. team visit in October–November 1981 was very poor. Both its leader, General Ezz, and its Polish "political advisor" were very rough on the H'Mong and went out of their way to avoid any bona fide meeting with Khmer personnel on the Thai-Kampuchean border. Not all of the team had any true expertise in CBW. The same was true of the second U.N. group in October–November 1982 although their attitudes were visibly more congenial.

This second group presented a pleasant, rather than surly and threatening mien and did not try to rush most of their investigation except that phase involving the Khmer Rouge. They were still far more concerned with protocol, safety and the avoidance of the Khmer Rouge than with doing a complete and credible study. Although the French and Peruvian Members were capable and conscientious on the first team as was the Swede on the second team, General

Ezz seemed more concerned with team form than function. Although with an allegedly good background in CBW, General Ezz did seem more doctrinaire and dogmatic—more lacking in imagination than I would have expected of one with his training and position of responsibility. It is my understanding both teams exhibited considerable professional discordance. Unfortunately neither the French consultant nor the Peruvian member remained with the second team. Allegedly Sweden would not allow the Swedish consultant to join the second team as a full member in replacement of the Peruvian Professor. The latter was believed to have avoided the second team to save possible awkwardness for the U.N. Secretary General.

One most obvious problem was that the team's leader(?) set unrealistic goals for the team, i.e., he made them dependent upon entry to, and free travel in, Laos and Kampuchea before conclusions could be written acceptably.

The other main problems were the lack of open ended time in which to study the allegations, the lack of good laboratory arrangements made prior to their arrival in Thailand and, on the first trip, the lack of a trip to see Afghani people in Pakistan or the allegations in Eritrea.

Question 6. Are you both convinced that, beyond a reasonable doubt, lethal mycotoxins have been used in Southeast Asia?

Answer. I am convinced beyond any reasonable doubt that lethal CBW weapons have been used, and are still being used, in SEA. It is also my impression that the young, the old, the infirm, the less well nourished and the more exposed die sooner and at a higher rate—as might be expected. However, I estimate that over 50,000 have died from short and for longterm effects of CBW agents in SEA since April 1975. We will never know how many.

It has also been my impression that lethality has decreased since 1981 although it has been higher further away from the border of Thailand.

Question 7. Do you believe that the Vietnamese have used mycotoxins in Cambodia? If so, to what degree has the Soviet Union been involved?

Question 8. Have lethal mycotoxins been used in Laos? By whom? If so, to what degree has the Soviet Union been involved?

Answer. I am convinced that mycotoxin CBW weapons have been used by the PAVN and Pathet Lao forces in Laos and by the PAVN in Kampuchea. I am also convinced that the Soviets (possibly with Eastern block countries) and, with the help of the PAVN, has been experimenting with variations in agents, delivery systems and antidotes and therapies as well.

Question 9. To what degree do you conclude the Soviet Union has been involved, both directly and indirectly?

Answer. From what I have learned these past 2 years I have no doubt that the Soviets have been the main supplier of, and instructor in, the use of lethal CBW agents in SEA. With their guidance, the H'Mong in particular have been in several areas treated as "laboratory test animals living in their natural setting." Although not as lethal as nerve gases, mycotoxins have impressed me as being an excellent CBW weapon—both with its terror effect and its evident short as well as long range impacts for use against ill armed and protected primitive tribesmen of SEA. The victims, and their animal and plant food supplies, are all effected simultaneously in most of the cases that I have interviewed.

Question 10. Dr. Townsend, are you convinced, beyond a reasonable doubt that the Soviet Union has used chemical weapons in Afghanistan and that some of those weapons were lethal?

Answer. I have not been to the Afghanistan-Pakistan border where it is my understanding that the CBW investigation is conducted solely by the U.S. Intelligence Community. However, from what information I have been privy to, as well as the logic of it all in view of known military capacity of the Soviets and their CBW military history since the time of their revolution, I am convinced, beyond a reasonable doubt, that the Soviets have used, and are using, CBW weapons of varying degrees of lethality in Afghanistan. However, I am also convinced by the style of their military action in that country, that this use is still largely more experimental than "necessary" and that it is just another useful proving ground for more serious potential use against China or NATO. CBW is a cheap way to wage a war—but it can be a devastating one and, depending on the agent, it can more effectively destroy an enemy's will to resist without damaging the "real estate" to the degree that even any neutron weapon would.

[Whereupon, at 4:45 p.m., the committee adjourned, subject to call of the Chair.]

APPENDIX

PREPARED STATEMENT OF STUART J. D. SCHWARTZSTEIN, DIRECTOR, CHEMICAL/BIOLOGICAL WEAPONS INFORMATION PROJECT, INSTITUTE FOR FOREIGN POLICY ANALYSIS, INC.

Mr. Chairman, I appreciate the opportunity to submit comments to your Subcommittee on the subject of "yellow rain" and the implications for arms control, following the February 24, 1983, hearings which you chaired.

For many of us the problem of use of chemical/biological agents in warfare became a matter of immediate concern and a high priority when in the autumn of 1981 evidence was made public confirming reports that the Soviets and their surrogates were using a variety of agents in Afghanistan, Laos and Cambodia. Those agents include mycotoxins, fungally-derived toxins, which have not been seen in use as weapons before, and which have achieved a notoriety as "yellow rain," as well as agents which have not yet been identified.

Although the evidence that chemical and toxin weapons have been and continue to be used is overwhelming and, I believe, can no longer be doubted by any objective observer, there remain a number of very important questions which need be answered, including the precise nature of the chemical, toxin and, possibly, biological agents being used, their effects, persistence, toxicity, and methods of use.

The realization that such weapons are being used, in violation of the Geneva Protocol of 1925, the 1972 Biological Weapons Convention and—perhaps more importantly, the universally-accepted prohibition now considered by most as customary international law—has, of course, important implications for further negotiations across the board. At the same time, the Soviet and Vietnamese clear-cut disregard for agreements in pursuit of their military and political objectives must teach us that negotiations or agreements—however, written—cannot substitute for continued vigilance and manifestations of strong concern wherever violations are suspected.

Mr. Chairman, as indeed you are aware in convening hearings on the subject, one of the greatest difficulties in dealing with the issues raised by chemical/toxin weapons use has been, and remains, the lack of public awareness. While a reluctance on the part of the majority of the public to confront an issue which is clearly unpleasant and at times horrific, the willingness of most of the media (the Wall Street Journal, the Reader's Digest and ABC are notable exceptions) is less understandable. Slowly, however, the subject is being recognized and being reported.

It is critically important, I believe, that violations of the universally-recognized prohibition on use of chemical weapons receive widespread attention from the public, both here and in other countries. It is only in that way that violations will then receive the strong condemnation that, as a heavy political price, will deter those who would use or continue to use such weapons. We should recognize, however, that with chemical, toxin and biological weapons that it is not usually easy to either focus attention or establish conclusively—to the degree necessary to generate public opprobrium—that chemical or biological weapons are being used. It is not only that such weapons are likely to be used in remote regions where there is extremely limited access—such as Laos, Afghanistan and Cambodia—but more importantly, that we are likely to see the use of a category of weapons whose chief military virtue lies in the difficulty of detection. From the viewpoint of the user, there are great advantages in using weapons that are either very subtle and perhaps not even noticed as weapons—indistinguishable from natural phenomena or simply inexplicable, even if suspected—or where verification and identification is so difficult that arguments continue to rage over whether or not allegations of use are true. This can also lead to situations where those guilty of use find that it is a distinct advantage to muddy the waters by

themselves making accusations, however preposterous, and thus lead some to dismiss all statements regarding chemical or biological weapons use as nothing more than a propaganda exchange.

This is, of course what has happened: it took more than 5 years to substantiate the reports from Hmong refugees that chemical weapons were being used against them. Even with a massive amount of human testimony, including that of several physicians and refugee workers who were convinced that many cases that they saw could not be of natural origin, the lack of physical evidence made it impossible for experts to say with any conviction that chemical weapons were being used. Indeed, it was all the more difficult because of the findings that the known chemical weapons, particularly nerve gases, were not being used. The length of time it took to establish that a little-known but highly lethal group of fungally-derived toxins was being used, the ensuing controversy and that, even today, there are a few individuals who find it difficult to believe that chemical warfare is being waged in Southeast Asia and Afghanistan, should serve as an important, if tragic lesson for us: that without effective and rapid means of investigation of reports of use or situations where use is suspected, that not only will there be victims—as we find still today—but that for nations whose rulers have little regard for morality or decency that there will be a strong temptation to develop other chemical or biological weapons which are difficult to even detect, no less seek protection from.

Mr. Chairman, to my way of thinking, one of the most important lessons that we should draw from the ongoing tragedy of use of "yellow rain" and other agents in Southeast Asia, and Afghanistan (and reports of use elsewhere) is that considerably better means of detection of use of chemical or biological agents is necessary, as are better means of establishing evidence beyond dispute. Important though the efforts of individual states may be—and those of the United States Government should be seen as of enormous value—it is clear that no one country, whatever expertise it possesses, can accomplish the critical move from detection of use to firm establishment of use as fact to the satisfaction of the world community.

Greater efforts clearly are needed to develop international mechanisms to deal with situations where violations may be occurring. The French proposals embodied in a United Nations Resolution passed during the last General Assembly may provide one means of addressing the problem. The detailed proposals of United States Government, as set forth in Geneva before the Committee on Disarmament a few weeks ago, also contain important proposals. It remains to be seen how far these proposals can be implemented. Nonetheless, efforts to achieve effective international monitoring of compliance of the 1925 and 1972 accords and the universally-accepted prohibition on use of chemical weapons are of critical importance if substantial progress is to be made in disarmament for this category of weaponry.

At the same time, there should not be undue confidence in the ability of any multilateral group to investigate situations with requisite thoroughness, and to bring to bear the best minds and expertise: too frequently, as we have seen with any United Nations groups and agencies, political considerations not germane to the issues at hand play a dominant role. More importantly, domestic defense requires that the USG establish and maintain research establishments which continue work on detection and protection for any kinds of agents which might be used. Much of the work can, and should be, purely medical including the development of epidemiological methodologies which can serve not only in situations where chemical or biological weapons are suspected, but which can serve in meeting a wide range of health needs.

It might also be noted that a number of aspects relating to monitoring and detection can complement efforts relating to protection of the environment and protection of populations against toxic substances used industrially or for agricultural purposes. In many respects the problems are similar, and the means which can be utilized also may be similar.

In an age in which rapid scientific advances are common and in which our understanding of man and the natural environment grows continually, there must be concommitant advances in our ability to control misuse of new technologies. If populations here and abroad, particularly in the less developed countries, are to be protected, significant resources—scientific, diplomatic, legal—will have to be devoted to developing effective safeguards and ensuring compliance in agreements. This may be the most important lesson we can learn from the continuing tragedy of "yellow rain."

○